The
Electrical Review

VOL. CXIV. JANUARY 26, 1934. No. 2931.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
Direct-current Transmission	109
Measuring High Resistances. By E. H. W. Banner	112
Industrial Heating	113
High-speed Diesel Engines. By A. Regnauld	115
Small Greenhouse Heating. By H. Church	116
Efficient Generation. By T. G. Simpson	117
Birmingham Trolley-buses	119
The Heating of a Modern School	119
Electrical Equipment in a Mines Rescue Station	120
Meetings and Discussions	121
Correspondence: Ilford Contractors and Lamp Sales; The Earthing of an Iron; Thirty Years Ago; Variations in Distribution Voltages; The New Regulations; A Prepayment Meter Problem; A Charge of Discourtesy; This Prosperity	123
New Apparatus and Devices	125
A Fair Trading Policy	127
Poor Speech at Technical Meetings. By "Auribus"	128
Business and Industrial Notes	130
Electricity Supply	134
Traction	135
Communications	136
Contract Information	137
Notes	138
Our Personal Column	139
New Companies Registered	140
Returns of Electrical Companies	141
City Notes	141
Stocks and Shares	141
Published Specifications	143
New Work for Contractors	144

Direct-current Transmission

THE disadvantages inherent in a.c. transmission have hitherto been very much more than counterbalanced by the ease with which this system enables voltage to be transformed, but the development of the controlled-grid mercury-arc rectifier and the thyratron has opened up new possibilities. It was the influence of these devices on the situation that formed the basis of the paper that Mr. H. Rissik read last week before the Institution of Electrical Engineers, the keynote of which was the practicability of inversion from d.c. to a.c., as well as conversion from a.c. to d.c.

This essential factor discounts the view expressed that prophecies of distinguished pioneers in electrical science as to an ultimate return to d.c. are in course of fulfilment; the kind of transmission under discussion is a link in a longer chain between the generating station and the consumer than the advocates of d.c. had in mind.

In Mr. Rissik's view—and we believe he will prove to be right for very many years ahead—d.c. generation on a scale large enough to fulfil modern needs cannot reasonably be anticipated. Also the flexibility of three-phase distribution and the rugged merits of the induction motor are incomparably in favour of a.c. at the consumers' end.

But the elimination of the undesirable features of a.c. transmission, due chiefly to inductance and capacitance, would not solve all our transmission difficulties. With d.c. we have the drawbacks of electrolysis and osmosis. We doubt, too, on the evidence before us, whether d.c. cables could be manufactured and laid as cheaply as a.c. overhead lines, as the author suggests, and we think it would be unwise, without considerable investigation under conditions approximating to the actual, to assess the advantages of d.c. over a.c. (apart from questions of phase angle) at more than $\sqrt{2}$.

For a European super-power scheme on the model put forward at the Berlin World Power Conference, to cover a distance of 7,000 miles, d.c. transmission would appear to hold out possibilities, although where comparative estimates of the costs of a.c. and d.c. transmission have been worked out, as in the plan for supplying power to Hamburg from Norway, the savings shown are inconsiderable, and limitations are still imposed by the inability of the mercury-arc rectifier to operate at very high voltages and of the thyratron to deal with heavy currents.

In relation to British needs, d.c. transmission has little to offer us, if we take the line of economic demarcation between the a.c. and d.c. systems at 100 miles and/or 100,000 kW. There are very few sections of the grid in which either condition is likely to obtain normally, although we should not deprecate a trial of the d.c. system in isolated cases in which special difficulties were encountered.

With lower-voltage transmission systems the arguments are still more in favour of existing practice. The subject, in this country, at least, is therefore likely to remain a matter of academic interest only, so far as can be foreseen at present.

On Trial

A FAIR TRADING COUNCIL has risen from the ashes of Committee "D." It has drafted and widely circulated particulars of a policy which it suggests should be given a year's trial. Full particulars of the movement appear on page 127, and these may be read in conjunction with our report of the speech delivered on Tuesday by the president of the E.C.A. The scheme is intended to enable the user of wiring accessories, lighting fittings and domestic appliances to obtain them at reasonable prices; to assure to distributors of such goods adequate remuneration for their services; and to give manufacturers a reasonable profit. To bring about this state of affairs in the electrical trade of Great Britain and Ireland is a very worthy objective, but, as has been said so many times and for so many years, it can only be secured if all sections of the industry can see their way to co-operate. A good deal must depend upon the attitude of electricity supply interests. The Council, however, has gone much farther than all who have preceded it, for it has elaborated a definite plan which

is now in the hands of the trade. The councils of the manufacturing and other named associations have adopted the basic principles of the policy for the main body of products mentioned, and we learn that various non-associated interests have had the matter favourably under consideration. The Council has a long row to hoe. The duties set for it during the first twelve months will be onerous and full of difficulty. Both the agreeing of discount schedules and the preparation of a Register of Recognised Users will raise many problems and toes may be trodden on, but all this and a good deal more is recognised by those who have undertaken the task. We have devoted a good deal of space to the subject this week, and we invite our readers to express their views pro and con. Everything is to be gained from a free and frank discussion of the merits and demerits of the scheme.

Knowledge and Intelligence

APHORISMS like "too great knowledge tends to paralyse initiative" often become detached from their context, and thus their meaning is distorted. Mr. H. W. Dickenson, who used this phrase in his contribution to the symposium on invention presented to the Institution of Mechanical Engineers, had already qualified it by pointing out that lack of knowledge of physical phenomena may retard development. A young engineer cannot acquire too much knowledge if he has the ability to use it, but knowledge is for practical purposes merely a tool; its application to the work in hand is the important thing. Thus many can accomplish so much more than others, although their store of learning is limited, only because they use their native intelligence to better advantage.

Looking Ahead

THE sub-committee appointed by the Hull Corporation to investigate the question of capital expenditure on its supply undertaking during the last four years, has issued a complete vindication of the forward policy of the city electrical engineer, Mr. J. N. Waite. One of the signatories to the report was the councillor whose criticism of the administration in the local Press brought about the inquiry, thus providing an example of the difficulty that a layman has in appreciating that capital expenditure on electrical works does not immediately produce a commensurate return. In distribution this is especially so, owing to the high proportion that excavation and reinstatement of the ground bears to the total cost of providing and laying a cable; this makes it a true economy to install mains with copper of large enough sectional area to deal with load for many years ahead. Apart from this, experience shows that it pays handsomely to plan a sound and comprehensive engineering scheme of distribution at the outset, as ultimately the cost per kW connected to such a network is very much less than it is where short-distance views and a hand-to-mouth policy prevail.

The Rising Tide

BY the addition of 59 miles of distributors to its l.v. network, Nottingham has joined the ranks of "all-cabled" towns. Coupled with this there has been great activity in loading up the mains, while the extension of the assisted-wiring scheme to the area outside the city boundaries, through the medium of a member of the E.C.A., has met with instant response. Mr. G. H. Lake, the city electrical engineer, tells us that the obvious merits of the Department's fleet of electric vehicles has resulted in the connection recently of several low-rate night-charging stations. The output increased last year by 27 per cent., but the maximum demand by only 15 per cent.; as 19,030 of the 22,320 kW of new connections were for domestic purposes, this class of consumer cannot be adversely affecting the peak. The total kW connected is 3.7 times the m.d., compared with about 2.9 for the rest of the country. In 1930 the ratio was 3.1 in Nottingham, compared with the general average of 2.5. Allowing for the effect on this margin of temporarily disused motors, the increasing ratio is presumably partly attributable to diversity in the use of domestic appliances.

Reyrolle's New Interest

AN interesting development that has taken place in the electrical engineering industry in North-East England brings into closer relationship two enterprising businesses which stand in the front rank among manufacturers of plant and equipment the reputation of which is very high both at home and overseas. The Parolle Electrical Plant Co., Ltd., the registration of which is recorded in our "New Companies" section to-day, has purchased the shares held by the late Sir Charles Parsons in C. A. Parsons & Co., Ltd., and Messrs. Reyrolle have subscribed for £260,000 of the ordinary capital of the Parolle Company. The directors of the latter company are Messrs. Norbert Merz and Mr. H. W. Clothier, of Reyrolle's, and Mr. F. G. H. Bedford, managing director of the Parsons Company.

Heavy-oil Engines

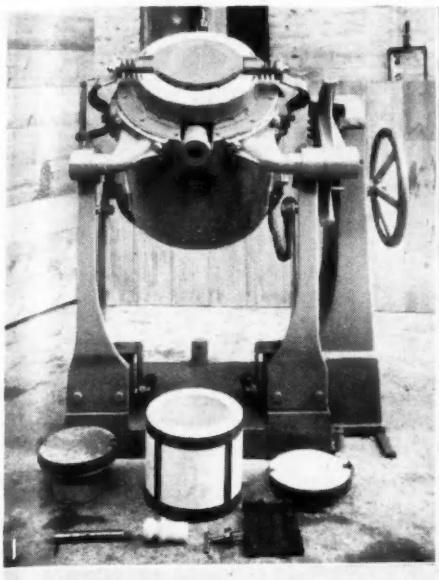
THE annual reports of the Diesel Engine Users' Association have shown that this body does not believe in an ostrich-like policy. Frank discussion of technical difficulties may have discounted some of the more optimistic claims at one time advanced, but these had no weight with engineers in any case. The information exchanged between members has done a great deal to influence opinion in the direction of regarding the modern form of the internal-combustion engine as an efficient and reliable piece of mechanism. That this is so must be attributed in a considerable degree to the data collected by the Association in the form devised by Mr. C. O. Milton several years ago. Normal evolution in design would, no doubt, have in time brought about a reduction in repairs and maintenance charges, but probably not anything like the 60 per cent. improvement made within the past eleven years—*i.e.*, from 0.18d. to 0.073d. per kWh generated in home stations.

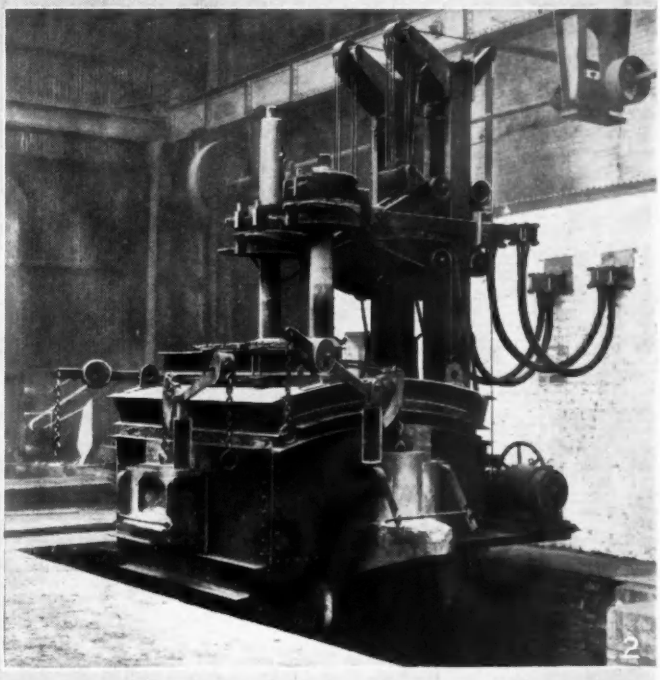
What is News?

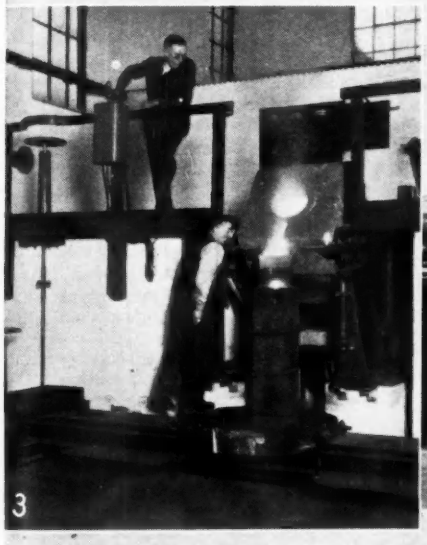
THE disproportionate amount of space allotted in a daily paper to the big change-over of public lighting at Southend to electricity (2¼ lines) and to the renewal of a gas contract in Southwark (six inches) may be regarded as a shadow of coming events. The replacement of gas by electricity is only to be expected and is therefore not "news"; the mere retention of gas is considered sufficiently remarkable to justify attention. While the rate of electrical progress may not just now be quite as much as this disparity in editorial space would appear to indicate, the view of the lay journalist is likely to be an "intelligent anticipation" of what will be. The new installation of "Escura" discharge lamps at Enfield, which we saw yesterday, provides further justification for optimism.

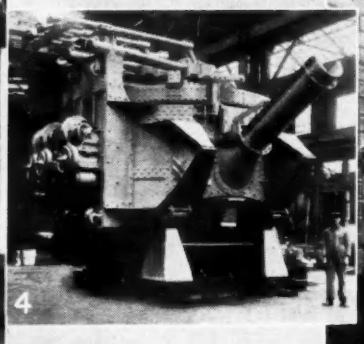
Prepayment Consumers

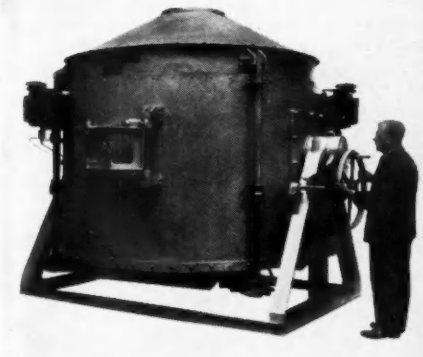
IN the light of the controversy that has taken place over tariffs for quarterly consumers the attention paid to the more difficult question of suitable methods of charging prepayment consumers has been somewhat meagre. The two important points are that the consumer should not feel that he is "up against" the fixed charge, and that he should receive every encouragement to use electricity for other purposes than lighting. The plan adopted by Mr. F. N. Rendell-Baker at Croydon, and described by him in our "Correspondence" section, appears to represent a real contribution towards a solution of the problem. It permits the smallest consumers to take advantage of the low running charge made by the undertaking, and has resulted in a considerably increased consumption on that account.

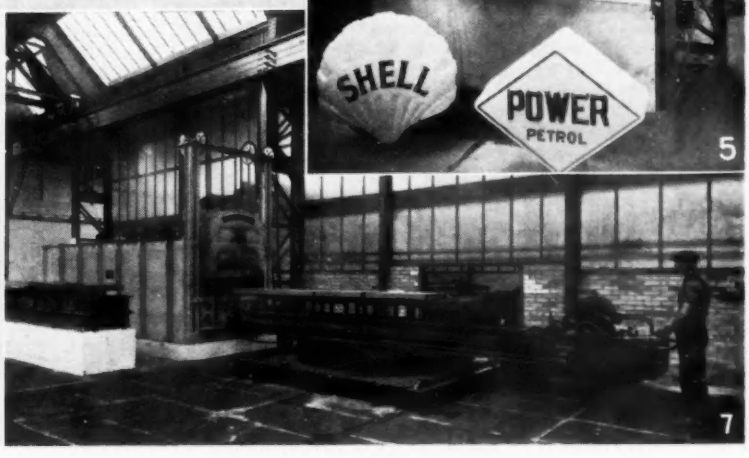












Examples of Electric Furnace Installations **(See page 113)**

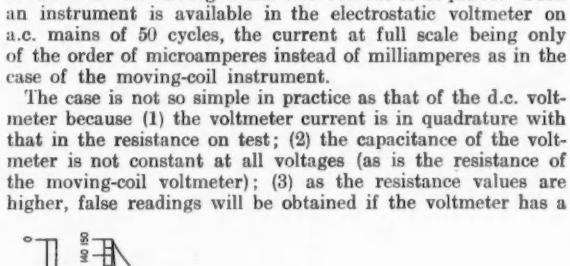
1. A 250-lb. Morgan crucible brass-foundry furnace. 2. A 2-ton, 670-kW Greaves-Etchells furnace (Watson (Metallurgists), Ltd.) at the works of Charles Markham & Co., Ltd., fitted with two 14-in. top electrodes and hearth connection (electrode driving motor on right). 3. A ¼-ton, 500-cycle Met.-Vick. induction furnace pouring high-quality steel. 4. A 20-ton Neroult arc furnace (Electric Furnace Co.) operated from a 6,000-kVA transformer; the unusually long spout was specially provided. 5. A 16-kW Catterson-Smith furnace at the works of Dura Glass, Ltd., firing decorations on electric lampshades at 600 deg. C. 6. A 1-ton G.E.C. resistance-type copper-melting furnace in a colonial Government railway workshop (max. operating temperature 1,250 deg. C., rating 150 kW). 7. A 1-ton Wild-Barfield annealing furnace with an electrically operated charging machine in the I.C.I. Works, Birmingham (loading 152 kW; 2 kW on the door).

Measuring High Resistances.

By E. H. W. Banner, A.M.I.E.E.

THE use of a moving-coil voltmeter and d.c. mains for reading resistances directly is fairly well known; in general such measurements may be made up to about 5 megohms using mains of 230 V and a voltmeter requiring not more than about 1 mA at full scale. To read up to a few hundred megohms with a direct-reading method in a similar way, not involving an expensive ohmmeter, it is obvious that a voltmeter consuming much less current is required. Such an instrument is available in the electrostatic voltmeter on a.c. mains of 50 cycles, the current at full scale being only of the order of microamperes instead of milliamperes as in the case of the moving-coil instrument.

The case is not so simple in practice as that of the d.c. voltmeter because (1) the voltmeter current is in quadrature with that in the resistance on test; (2) the capacitance of the voltmeter is not constant at all voltages (as is the resistance of the moving-coil voltmeter); (3) as the resistance values are higher, false readings will be obtained if the voltmeter has a



Values of added resistance (x) plotted

low insulation resistance; (4) the presence of capacitance in the resistance on test will upset true quadrature and give incorrect readings; (5) it is difficult to predict the resistance scale unless the change of capacitance with voltage is known; (6) the square law at the commencement of the voltmeter scale limits the lowest voltage reading.

Within the above limits the method is quite sound. In order to overcome difficulty (5) it is possible to maintain the capacitance of the voltmeter sensibly constant by shunting it with a sufficiently large condenser: the measureable range is reduced in the same ratio, however.

To consider this simpler case first, assume a 250-V electrostatic voltmeter having its capacitance increased to 637 $\mu\mu$F and constant. At 50 cycles the voltmeter reactance X=5 MΩ. Applying 230 V and with x=5 MΩ in series the reading will be, not 115 V, but $\sqrt{2}\times230/2=163$ V. The general expression for scale reading for a given added resistance x is obtained as follows:—

Reading=V cos α, where tan α=x/X and V is the line voltage, assumed in this case to be 230 V. If 50 V is readable on the scale the maximum value of x will correspond to V cos α=50, or cos α=0.217 or α=77.5 and tan α=4.49 and x=22.5 MΩ. The usual case of the unshunted voltmeter increases the measurable range considerably as the voltmeter capacitance is low at low voltages.

Assume that the voltmeter to be used is of 250-V range and has a full-scale capacitance of 63.7 $\mu\mu$F. This is quite a normal value and is chosen to simplify the figures. At 50 V, the first mark on the scale, the capacitance will be about 16 $\mu\mu$F, or a quarter of that at full scale. To find the resistance corresponding to 50 V and proceeding as before, the only difference is that X is now four times that at full scale where X was 50 MΩ; tan α=4.49 as before and x=4.49×200, nearly 900 MΩ. This shows that the range is very wide in spite of the fact that it is not possible to read as low on the scale as it is on the d.c. voltmeter.

To deal with the various objections the "impurities" will be considered. They are resistance across the voltmeter and capacitance across x, the resistance on test, singly or together. Inductance in series is also dealt with. In the case of the instrument having a full-scale capacitance of 63.7 $\mu\mu$F, X=50Ω, and if the insulation resistance is as low as 50 MΩ a serious error will result. In practice the insulation resistance is far greater than this unless the instrument is a very poor one or is dirty or damp.

Any impurity reduces the voltage read on the instrument and so gives higher readings for the resistance on test. If the insulation resistance is only 50 MΩ then with x=50 MΩ in series the reading will fall from 163 to 103 V. Capacitance across the resistance, such as a cable, where C=63.7 $\mu\mu$F, shunts the 50 MΩ resistance with 50 MΩ reactance and reduces the voltmeter reading to 142 V. Both impurities together are equivalent to two similar networks in series and the reading is half of 230 V or 115 V.

Negligible Induction Effects

Inductance has little effect. For an impedance of 50 MΩ, the value used above, the inductance would have to be 159,000 henrys, and for 1 per cent., neglecting phase angle, the inductance would still have to be 1,590 henrys, a very high value. As an example of the procedure to evaluate the scale in megohms, a 150-V instrument designed by the writer will be considered as a curve of capacitance and voltage was available. At 150 V the capacitance is 120 $\mu\mu$F and at 30 V 22 $\mu\mu$F. If the supply voltage is 150 V full-scale deflection is obtained when x=0. Working as before and knowing that at 30 V on the scale C=22 $\mu\mu$F, then X=145 MΩ; tan α=5.9 and x=5.9×145=855 MΩ.

For other values of instrument reading the corresponding values of x are found and plotted. From the resulting curve a scale of megohms may be drawn alongside the voltage scale. Two megohm scales have been drawn for the curve, one ten times the other, in order to give open readings for the lower resistance values. A number of values of resistance and scale reading were calculated and used to draw the curves; they are not reproduced as the procedure for each is exactly as for the examples given.

This method of direct indication of high resistances is a relatively cheap one, only an electrostatic voltmeter being required. Where such an instrument is already available the only extra is the curve of volts and megohms. For higher readings a transformer and a higher range voltmeter may be used. As a higher range voltmeter has a lower capacitance an increase of voltage by a factor of 2 increases the resistance range about four times.

However, the purpose of the article is mainly to show the use of mains and easily obtainable voltmeters to read resistances directly, not to advocate the marketing of such resistance testers for this specific purpose. It is of more general applicability in the laboratory rather than for unskilled personnel in the factory.

The Hull Investigation

ON September 26th a special sub-committee of the Hull Electricity Committee was set up to consider the question of the capital expenditure on the electricity undertaking during the past four years in its relation to the present turnover. The report now issued by the sub-committee shows that the capital expenditure increased between March 31st, 1929, and March 31st, 1933, by £1,586,562 to £3,791,720, and that the revenue increased by £198,955 to £360,976. The sub-committee was assured that no consumer was being supplied below cost, and satisfaction is expressed that, having regard to the need for providing for probable requirements for some time ahead, which results in an increase in capital expenditure not bringing in an immediately corresponding increase of revenue, such expenditure has been fully justified.

In his report the city electrical engineer, Mr. J. N. Waite, said that during his term of office the increase in capital had been allocated as follows: To generation, £325,088; to distribution, £1,084,533; and to hire and hire-purchase schemes, £176,941. The outstanding new capital was £1,024,262, on which the increased revenue represented a return of 19.4 per cent. Moreover, during the period reductions in tariffs amounting to £162,000 had been made (£77,000 in 1932-33). The extensions to the distribution network both within and without the city were, as a whole, already producing a revenue to cover all the costs pertaining to them. The main framework of the distributing system covering the whole area of supply having been laid, new supplies could be given with relatively low capital expenditure. In the four years the undertaking had paid £104,178 in rates, £316,566 to the sinking fund, and £245,734 as a contribution from revenue to capital. It had also met all charges on new and existing capital and made a net profit of £205,726.

Industrial Heating

Electric furnaces offer an enormous field of development

WHETHER or not Mr. Verdon O. Cutts (General Electric Co., Ltd.) is correct in his assertion that industrial heating is the electrical industry's biggest potential field, it is certain that there is so much electric furnace business awaiting capture that a new and wider outlook is required. Broadly, an electric furnace consumes its capital value of electricity in one to two years, and it also creates a considerable demand for transformers, switchgear and converting machinery. It seems to be generally accepted that a furnace is an appliance for heat treatment above 500 deg. C.; for anything below that temperature the appliance would be termed an oven.

Why are the prospects so good? For some years there has been a progressive movement to eliminate the enormous waste of metals by corrosion—hence the introduction and rapid advance of stainless steels. As a consequence new alloys are constantly being introduced, and it may not be a serious exaggeration to say that we are approaching the time when high-grade steels will become ordinary steels.

In the production of these alloys it is becoming increasingly clear that electricity produces by far the finest results; indeed, the electric melting furnace is the only means of producing some of the very high-grade steels. Further, for heat treatment of the new alloys exacting conditions of temperature control are imposed, and on this point electricity has always scored. So we have two large and important working fields for the electric furnace, melting and heat treatment, two distinctly different subjects, electrically and non-electrically.

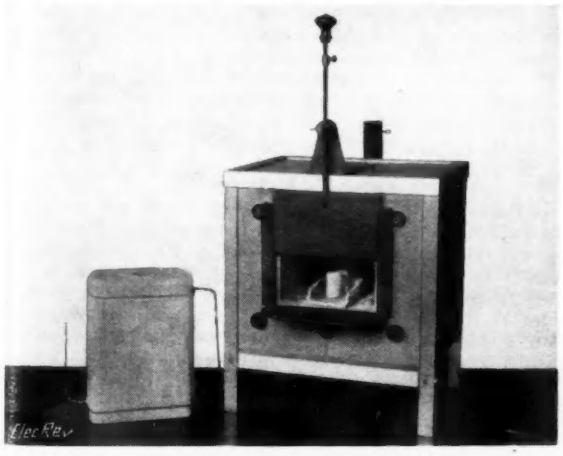
During a recent investigation of the subject we heard of many cases where the first electric furnace was purchased because of the ease of control and subsequent ones were obtained on the score of proved economy. There are, however, still many "fuel-minded" people about who must be educated, and there is urgent need for competent and specialised advisers on the staffs of supply undertakings.

The limitations of the electric furnace should be thoroughly realised. It is likely that the fuel furnace will always hold the field for melting ordinary steels, as we now know them, and where crude heat requirements are associated with heavy open-door losses there is little chance for electricity, although, of course, the situation might change as it did with high-speed steel furnaces. For success adequate "servicing" of installed equipment is essential, for to give immediate attention in the case of breakdown creates the desired confidence.

Melting Furnaces

Wherever there is fuel in combustion in contact with molten metal sulphur must contaminate the product. For the higher grades of steel the sulphur and phosphorus contents must be reduced to the absolute minimum.

Arc furnaces are suitable for reasonably high-grade steels, and very many were installed for this purpose during the war—so many in fact that until they have been reabsorbed there

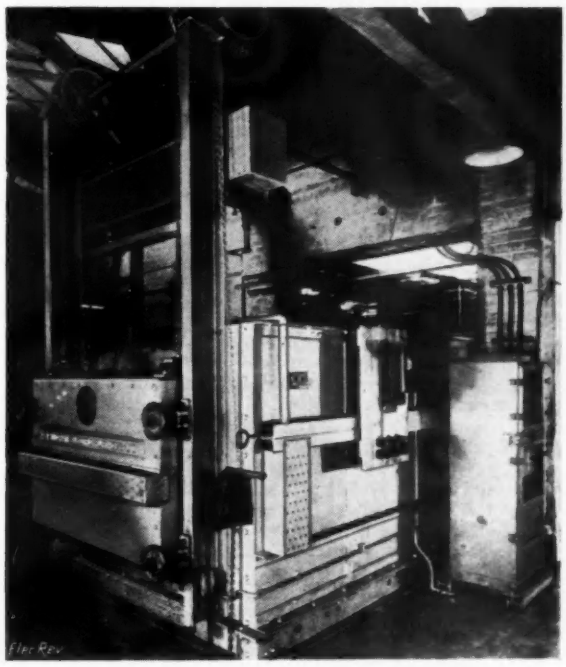


A Gallenkamp muffle furnace used for coal ash-content determinations at 1,000 deg. C. (2 kW); spare furnace linings and element on left

is little scope for new business by the manufacturers. But Mr. Greaves, of Messrs. Watson (Metallurgists), Ltd., told us that with continued trade improvement there is every prospect of the war-time equipment being absorbed during the next few months.

It is now being realised, said Mr. Gifford (Electric Furnace Co., Ltd.), that better grades of cast iron are available from the electric furnace, and for this work also the arc furnace is suitable. Two "Efco" furnaces of this type installed at the Ford works, Dagenham, indicate the type of demand for furnace equipment. They are of 10,000-kVA capacity and are in 24-hour day service. Assuming a load of 6,000 kVA, the consumption is about 30 million kWh per year.

Good-quality cast iron is also produced satisfactorily in the induction furnace, but Mr. King (Metropolitan-Vickers Electrical Co., Ltd.) indicated that the big development of the near future for this type of furnace would be refining. The scheme



A "Birlec" carburising furnace in the Rolls-Royce works (110 kW, 1,000 deg. C.)

is to pour molten metal from fuel furnaces into the induction equipment, and then to put on the metal a slag which combines in chemical action with the metal impurities, so that the combination can be removed easily. But for complete success of the induction furnace the process must be reasonably continuous. The stand-by losses for an eight-hour day would be too heavy. It must have some molten metal in it for starting, and reasonably uniform continuous analysis of the product is necessary. These conditions are met for the production of metal for rolling mills, but not for foundry work.

For the production of the highest grades of steel, however, there is nothing to touch the high-frequency furnace. High-speed tool steel contains chromium which will absorb carbon, and no carbon is employed in any way in the high-frequency furnace. The turbulence in the molten metal produced by the eddy currents results in perfect mixing of alloys of different specific gravities. There are no heat transmission losses, and it is quite common for a h.f. furnace to save its cost, including auxiliaries, in two years. Any size h.f. furnace—2-cwt. or 2-ton—can be used on the same auxiliary equipment.

Nearing Optimum Efficiency

We are near the time, said the Metropolitan-Vickers engineer, when the h.f. furnace efficiency will be so high that there will be little point in making it higher. The coal-fired crucible has an efficiency of only about four per cent., and there is really no question of serious competition. After all, the cost of power is only about 20 per cent. of the total cost of production of the steel.

Mr. King suggests that the short life of the p.f. correcting transformer will have to be overcome by a change of materials used in the condenser construction. In the Metropolitan-Vickers shops we saw a 1,250-kW, 1,125-cycle single-phase machine which is to serve a 2-ton and a 5-ton furnace (produced in conjunction with the Electric Furnace Co., Ltd) in the shops of Messrs. Samuel Fox & Co. The 5-ton equipment is believed to be the largest so far made in this country.

Little has been done with electric melting for foundry work, probably on account of the heavy capital outlay required for suitable furnaces for big castings. A furnace developed in America for this purpose, however, has a fair promise of suc-

cess. It has horizontal electrodes and it rocks sideways, so that the moving liquid-metal has a cooling effect upon the refractory to some extent.

For non-ferrous foundry work, however, there is the crucible furnace produced by the Morgan Crucible Co., Ltd., in which the container is actually the element. It offers the combined advantages of the ordinary crucible melting and the finer control characteristic of electrical operation. The distribution of heat over the whole of the container tends, of course, to greater efficiency, but Mr. Gow told us that its use was not so much a question of economy as of metallurgy. "As manufacturers of all kinds of crucibles, we first offer a client one for fuel firing; if he wants finer working results, we then suggest the electric furnace."

For the melting of metals requiring lower temperatures electric resistance furnaces give excellent results and economical working. Such furnaces present little difficulty, and are now available in sizes up to about 12 ft. in diameter.

Heat Treatment

It is in connection with the heat treatment of metals that electricity enters into more serious competition with fuels. The licking contact of the oil flame and the high velocity of the gas jet are certainly strong points where crude heat is required; but finer control is becoming almost the universal demand. Further, electricity is gaining ground on the score of economy.

The G.E.C. expert said that with reasonable tariffs the electric furnace was definitely competitive for annealing, normalising and case-hardening steel, and also for annealing and normalising brass sheet, strip and stampings. He did not know of a non-electrical instance of nitriding—a long-duration process (up to 95 hours)—for which, under automatic control, the material and furnace could be left unattended.

Mr. Burnand (Messrs. W. E. Burnand & Co., Ltd.) said that at the higher temperatures gas was very inefficient because of its high velocity, and if it were not for the cost of maintenance of the elements for high temperatures gas could not "get a look in." He believed that his company had made the first electric furnace for producing razor blades, as the result of an inquiry involving dissatisfaction with a gas furnace.

Mr. Pickles (Birmingham Electric Furnaces, Ltd.) said that in an electric furnace 80 per cent. of the heat was absorbed by the work, while for a gas equipment the corresponding figure was 20 per cent. For carburising, gas at 2s. 6d. per 1,000 cu. ft. and electricity at 0.6d. per kWh represented about equal running costs for short periods, but electricity had the advantage for long periods because it eliminated flue losses.

Perhaps the most promising work for the electric heat-treatment furnace is bright annealing. Although Mr. Pettit (Incandescent Heat Co., Ltd.) favoured the electric furnace for low temperatures, because with the fuel-fired furnace it was necessary to adopt some dilution method to get down to, say, 500 deg. C., he thought that at high temperatures the products of combustion gave the required atmosphere for neutralising, &c. The Birmingham Electric Furnaces representative maintained that it was the development of the electric furnace which had led the gas people to control atmosphere. With the gas furnace it was necessary to sacrifice heat efficiency to obtain the necessary atmosphere for bright annealing. Gas sometimes had constituents which prevented bright annealing. Electric heating, of course, was quite independent of the furnace atmosphere.

Finishing Processes Obviated

What is more important perhaps is the elimination of subsequent cleaning and pickling operations rendered possible by bright annealing. Mr. Greaves told us of a furnace supplied to Messrs. Viners, Ltd., which was designed to keep pace with rolling operations and replaced a gas furnace, with consequent elimination of the pickling plant. The resulting improvement of the surfaces of the product was such that a saving of 4s. 6d. per gross of the product was effected by reduction or elimination of buffing costs. One of the virtues of the salt-bath furnace, he said, was that the treated article was covered with a film of salt, so preventing oxidation. His company had recently installed such a furnace to give 1,300 deg. C.—probably the only one of its kind in existence.

Messrs. Wild-Barfield told us about samples of aluminium strip, equal in all respects, which were annealed by order of Messrs. W. T. Henley's Telegraph Works Co., Ltd., one in an electric furnace and one in a gas furnace. The results from the electric furnace were so much better than those from the gas furnace that the material from which the samples were taken was all treated electrically.

The following extracts from a letter from Messrs. Darwins, Ltd., refer to three G.E.C. furnaces. "We use these furnaces for magnet hardening, and a variation in hardening temperature of more than ±7½ deg. C. at once influences the magnetic properties. The output per furnace is about 100 lb. per hour. The three operators could easily attend to a fourth furnace if necessary. We have now reduced the current consumption to less than 0.2 kWh per lb., and the labour cost is not more than 0.15d. per lb. If we reverted to our old type gas furnace we should require at least ten operators."

By far the majority of heat treatments can be effected at up to 1,000 deg. C., which presents no serious difficulty, but there are many calls for higher temperatures, and they are likely to increase with the further introduction of new alloys. Refractories and various general constructional features all introduce difficulties, but it is the element which really limits the working temperature. Temperatures up to well over 2,000 deg. C. can actually be attained and used, but only at serious sacrifice of the element and furnace life.

Mr. Clements, of Messrs. A. Gallenkamp & Co., Ltd., referred to hydrogen-cooled molybdenum elements which afford up to 1,850 deg. C. furnace heating. The life limit of metallic elements is decided by oxidation, and for temperatures up to about 1,100 deg. C. nickel-chromium has given every satisfaction.

Until recently, however, for temperatures above that figure some form of carborundum element has been used. Because the non-metallic element changes its characteristics under heat and requires careful handling, and because over-running is almost a human instinct, ideas vary considerably as to the limitations of temperature and life of such elements. The life limit is dictated by disintegration of the material. Mr. Waterhouse, of the British Resistor Co., Ltd., puts the life of a "Globar" element operating in a plain atmosphere at from 600 to 1,500 hours.

Compensation for Resistance Rise

Cooling difficulties are definitely not the limitation to temperature of the "Silit" element, said Mr. Newing (Electrical Equipment & Carbon Co., Ltd.). He quoted figures of 1,400 deg. C. and 1,500 deg. C. for continuous and intermittent working respectively. The great drawback was that above 1,400 deg. C. the material permanently increased its resistance. Some people alleviated this problem by installing a regulating transformer, so that as the element resistance increased the voltage could also be increased to give the required loading. Mr. R. M. Catterson-Smith has found it good practice to group elements in parallel, resulting in a tendency for all the elements to balance up should the resistance of one increase. He was using 2½-kW (maker's rating) "Silit" rods loaded at only 600 W, with, of course, considerably greater initial expense.

Much progress has been made in the production of new alloys to meet the higher temperature requirements, and a notable example is "Kanthal," a steel alloy containing, *inter alia*, aluminium, cobalt and chromium. It appears to have the same life at 1,200 deg. C. as chromium at 1,050 deg. C. Mr. Catterson-Smith has had considerable success with this metal, from which he has successfully obtained furnace temperatures up to 1,380 deg. C. Because of its higher resistance, he said, one can put in a heavier element and so obtain a greater radiation area with a consequent near approach to the furnace designer's ideal of the greatest possible difference between the temperature of the furnace and that of the elements.

It is found that the resistance of this class of material rises about 10 per cent. at above 1,100 deg. C., and this helps to reduce both the resistance and heat at the ends. He has overcome considerable contact trouble by extending the element ends right outside the firing chamber and using a good substantial screw-on contact. "Kanthal" is as soft as putty when it is hot, and so has to be supported at all points in the furnace.

Furnaces in Potteries

In the foregoing we have dealt solely with the predominating possibilities of furnace business in the metal industries. But there is very much room for development in many other kinds of manufacturing. In the potteries, for instance, furnaces are required for firing the clay (1,350 deg. C.), glazing (1,100 deg. C.) and decoration firing (900 deg. C.). Mr. Gibbons, of Messrs. Gibbons Bros., Ltd., spoke enthusiastically of the excellent results achieved by electric furnaces for decoration firing, in which a temperature variation of five per cent. would spoil a good-class decoration, and he seemed hopeful that the development of "Kanthal" would lead to business in firing for glazing.

For the last operation several electric furnaces have been working with conspicuous success for a few years, and we look forward with confidence to an increased use of electricity in the pottery industry, at any rate for glazing, in the near future.

To a considerable extent the use of electric furnaces in the laboratory indicates the possibilities in industry generally, and it was therefore pleasing to hear Mr. Clements name many of the kinds of research and other laboratories (from the pathological room to the steel works research department) to which Gallenkamp furnaces have been supplied.

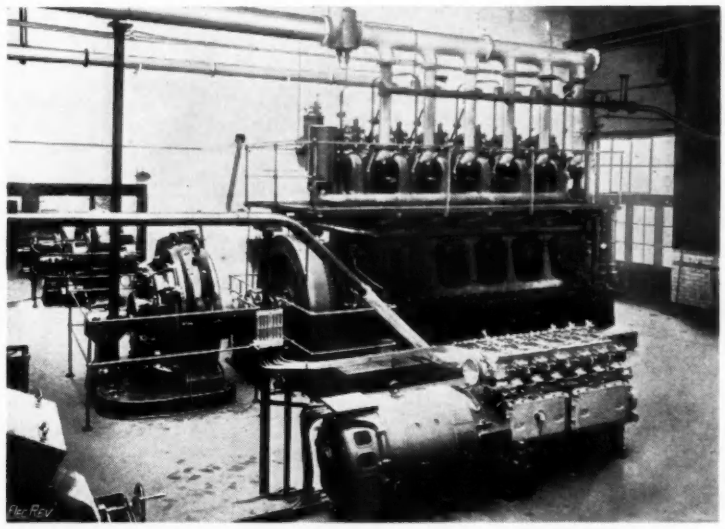
High-speed Diesel Engines. By A. Regnauld, B.Sc., M.I.E.E.

Economy in space and cost

FROM the time of its inception—now more than forty years ago—the Diesel engine has suffered in comparison with other types of prime-mover from its excessive weight and large overall dimensions. It so happened that the years that saw the introduction of the Diesel engine also witnessed the practical beginnings of the steam turbine, thereby emphasising the disadvantages of the former, and as a consequence, except for units of relatively small capacity—say, up to 500 kW—the internal-combustion engine was seldom considered suitable for driving electric generators.

Among the many factors which contribute to the size and weight of the Diesel engine, not the least important is the economic piston speed which, of course, is dependent upon the nature of the combustion process in the cylinder, and in the early days of Diesel engine design the limiting piston speed was in the region of 700 ft. per min. The cylinder dimensions were also subjected to certain well-defined limitations, so that using a piston stroke of 12 in. the speed of the shaft could not exceed 350 r.p.m. (for piston strokes below this figure the now obsolescent semi-Diesel engine was developed). Many Diesel engines were designed having speeds of rotation considerably below this figure, with the result that not only the engine but the generator to which it was coupled were both heavy and cumbersome.

The demand for engines of low power using heavy oil as fuel has led to the introduction of numerous types in which the objectionable features of the semi-Diesel type have been eliminated and higher piston speeds have been adopted until to-day we have compression-ignition engines with speeds of rotation in excess of 2,000 r.p.m. and piston speeds of 2,000 ft. per min. These engines have been developed principally for driving buses, motor coaches and lorries, in which mechanical gearing is employed between the engine shaft and the driving wheels. Their influence has, however, spread in many directions, and high-speed Diesel engines are now being extensively employed for driving electric generators, notably on the heavy-oil locomotives and rail-cars which are being so extensively adopted by railway companies all over the world in their endeavours to counter the adverse effects of road competition. A number of ships have also been recently fitted with Diesel-electric propelling machinery, and signs are not wanting that this type of equipment will become of increasing importance in the near future.



A six-cylinder 120-h.p. "Mirrlees-Ricardo" high-speed (1,200 r.p.m.) engine (front) compared with a "Mirrlees-Diesel" slow-speed (300 r.p.m.) engine of the same rating

Smooth Running

But apart altogether from those applications in which the use of electricity constitutes what may be regarded as a convenient form of gearing between the engine and the driving units of the locomotive or the ship, the high-speed Diesel-engine-driven generator is also being employed when electricity is required for more orthodox purposes, such as lighting, heating and ventilating buildings, supplying power for driving industrial motors and so on.

These engines are necessarily of the multi-cylinder type so that an almost perfect balance is possible; thus, what has hitherto been regarded as one of the greatest disadvantages of the internal-combustion engine has been eliminated. I have seen a Diesel-engine-driven generator running on the test bed at a speed of 500 r.p.m., and it was possible to stand a penny up on its edge on any part of the cylinder tops. Thus, in addition to the undoubted economy which follows the use of the compression-ignition engine, a smooth running unit of relatively small size and weight is obtained which is actually less costly than a slower running machine of the same output.

Some idea of the progress which has been made in the design of high-speed Diesel-engine-driven generators can be gathered from the following brief particulars of a few typical sets. For supplying electricity at the new Bank of England, Messrs. Davey, Paxman & Co. (Colchester), Ltd., have supplied four eight-cylinder 440-b.h.p. engines running at 650 r.p.m., while five somewhat smaller units each having six cylinders, but running at the same speed, have been supplied to the Prudential Assurance Company for the general requirements of its office buildings in Holborn, London. Even more notable are the engines incorporating the Ricardo patents in which the sleeve-valve principle is employed instead of poppet valves.

Mr. A. Regnauld is senior lecturer and superintendent of workshops at Faraday House

In an article in the ELECTRICAL REVIEW of October 20th last on the Diesel-electric tug *Acklam Cross*, I described the two Brotherhood-Ricardo engines installed in that vessel; these engines each develop 300 b.h.p. in six cylinders at a speed of 900 r.p.m. In addition to Messrs. Peter Brotherhood, Ltd., the pioneer company of Messrs. Mirrlees, Bickerton & Day., Ltd., of Stockport, who were responsible for the first cold-starting heavy-oil engine built in this country, are now constructing engines incorporating the Ricardo patents and, in particular, mention may be made of an electric generator driven by a 120-b.h.p. six-cylinder engine at 1,200 r.p.m. This set is illustrated.

A study of the various types of heavy-oil engine which have recently been fitted in Diesel-electric railway locomotives and rail cars reveals that speeds ranging from 700 to 1,100 r.p.m. are employed, while for road vehicles the speeds sometimes exceed 2,000 r.p.m., although the electric drive is seldom employed. All these engines have proved thoroughly reliable in operation.

Fuel consumption is in the region of 0.35 lb. per b.h.p.-hr.; coupled to an electric generator the figure would be about 0.48 lb. per kWh. Thus, they share with the low-speed Diesel engine the distinction of being the most economical form of prime-mover in existence while, in addition, the advantages which follow the adoption of high speeds of rotation render them particularly suitable for driving electric generators of a capacity not exceeding 250 kW.

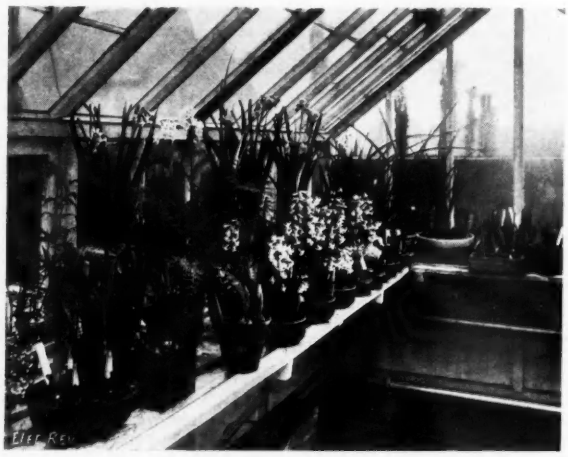
Welded Ships

THE first vessel of her kind to be built in this country, the *Arcwear*, is to leave the Tyne on trials within a few days says *The Times*. She is an "Arcform" efficiency ship designed by Sir Joseph Isherwood and built by Short Bros., Sunderland. It is maintained that the stream-lined hull gives the ship an increased speed without an increase in fuel costs. Her speed is to be eleven knots on a coal consumption of twenty-one tons a day. Electric welding has been substituted for riveting in most parts of the vessel.

The North Eastern Marine Engineering Company, Wallsend, which is completing the engines, has also received the contract for installing the engines in the *Arctees*, a similar vessel to be launched soon at Middlesbrough.

Small Greenhouse Heating. By H. Church, M.C., M.I.E.E.

THE advantages of electric heating for small greenhouses, as compared with other systems, are now being appreciated by the gardener. The chief of these advantages are as follows: Electric heaters are easily installed; automatic temperature control by thermostat ensures easy regulation of heat, so that when desired the user can maintain a definite minimum temperature within close limits for a period (for example, during the winter a night temperature of 5 deg. or 10 deg. less than the day temperature can be regularly main-



Inside Mr. Church's greenhouse at Christmas

tained) and the minimum temperature can be increased by a definite amount for a period of days or weeks in order to urge forward the growth of certain plants; the system is reliable and clean, free from fumes, and requires the absolute minimum of temperature; all the heat is in the greenhouse; and the greenhouse can be left unattended for long periods (several days at a time), the only points to be watched being watering and ventilation. No attention is necessary from the outside of the greenhouse—an important factor in bad weather.

But the gardener is also concerned with the cost of the equipment and more particularly the subsequent running costs. Suitable equipment can now be obtained at very reasonable prices. In the ELECTRICAL REVIEW, December 1st, 1933 (page 767), some figures were given relating to the results obtained with a lean-to greenhouse representative of many in use throughout the country. A type in much wider use, however, is the span-roof type, and it is with such that these notes are concerned.

Details of Equipment and Tests

The loading required in any particular greenhouse depends on its type, size, construction (whether wood or brick sides), its situation and protection from cold winds, and the minimum temperature to be maintained during the winter. A temperature of 40-45 deg. F., *i.e.*, an efficient protection against frost, is what many gardeners require. Such a temperature will safely preserve most plants and will promote good growth of many, but it will not force plants. For example, it is fairly certain that a prepared hyacinth potted early in September and, after the usual period in the dark, transferred to a greenhouse at 45 deg. F. would not be in bloom by Christmas, but if subjected to a temperature of 55-65 deg. F. for a few weeks in November and December it would then be in bloom for the festive season.

This winter I have carried out some tests on a greenhouse and a small electric frame. Consumptions were recorded for a small span-roof greenhouse with an installation designed to give normally a minimum temperature of 40 deg. F., but, when desired from the point of view of advancing the growth of the plants, to increase it to 45 deg. F., and also for a small electric frame operating at 55-65 deg. F. and used for forcing a quantity of bulbs.

The house measures 10 ft. long, 7 ft. wide and 7 ft. 6 in. high to the ridge, and is constructed of wood and glass only. It is a greenhouse of average sound construction erected in an exposed position, and may be regarded as a representative case. The electrical equipment consists of a 1,000-W electric water heater controlled by a thermostat, and with a 15-W pilot lamp. The maximum and minimum thermometer was set each evening and recorded at 8 a.m. each morning, and the minimum outside temperature during the night, the consumption, and the weather conditions were recorded daily.

The thermostat was set to give a minimum temperature of 40 deg. F. measured by the thermometer, and for two periods of about ten days each the temperature was increased to 45 deg. F. to bring forward certain plants. One of these periods happened to be an extremely cold spell in December.

The frame (3 ft. by 2 ft.) has heating tubes loaded at 275 W controlled by a thermostat. It is mounted outside and adjacent to the greenhouse, and the air temperature near the plants was recorded daily.

The consumptions for the greenhouse were as follows: October 1st to December 31st, 616 kWh; average per day, 6.7 kWh, and average per week, 47 kWh, representing 2s. per week at ½d. per kWh. Consumptions for the frame were: November 1st to December 26th, 149 kWh; average per day, 2.66 kWh, and average per week, 18.6 kWh, corresponding to 9¼d. per week at ½d. per kWh.

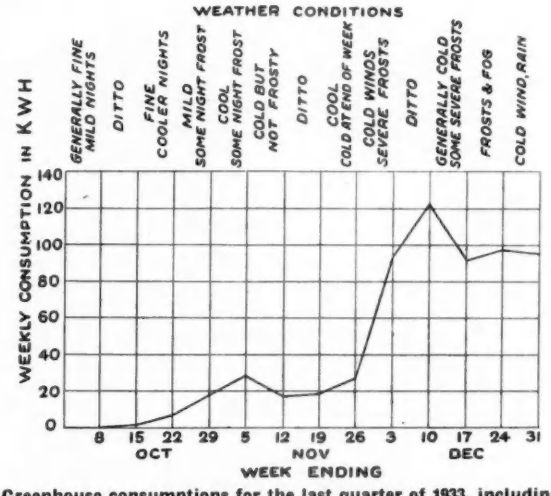
The frame was run uncovered, *i.e.*, with the glass exposed to the atmosphere, and the consumption could be considerably reduced by covering the frame at night and also if the frame were used inside a greenhouse. At all times it was slightly open for ventilation.

Horticultural Results

The general condition of the plants in the greenhouse was good, and bulbs which were not subjected to forcing in the electric frame made reasonable growth. Those which were forced included polyanthus narcissus, paper white, which were in bloom in the last week of November; chinese sacred narcissus, first week of December; early roman white hyacinths, first week of December; prepared hyacinths, white, pink, blue and yellow, Christmas Day; and Duc van Thol tulips, and iris tingitania.

It is obvious then that electric heating in small greenhouses produces good results and is reasonable in cost, apart from further advantages over other methods. A small electric frame can be used for forcing at higher temperatures and good results also obtained at reasonable cost. The combination of the two will enable the gardener to produce early blooms without the necessity and cost of maintaining the greenhouse at a higher temperature.

The greenhouse results above refer to efficient frost protec-



Greenhouse consumptions for the last quarter of 1933, including a prolonged very cold period

tion. Of course higher temperatures can be easily maintained, provided that heaters with the necessary loading are installed. The electric propagating and forcing frame can be used for the germination of seeds at their correct temperature. This is generally higher than the subsequent growing temperature, and it is very easy to reduce it at the right time, and when desired the seedlings can be transferred to the cooler greenhouse.

Road Traffic Signals

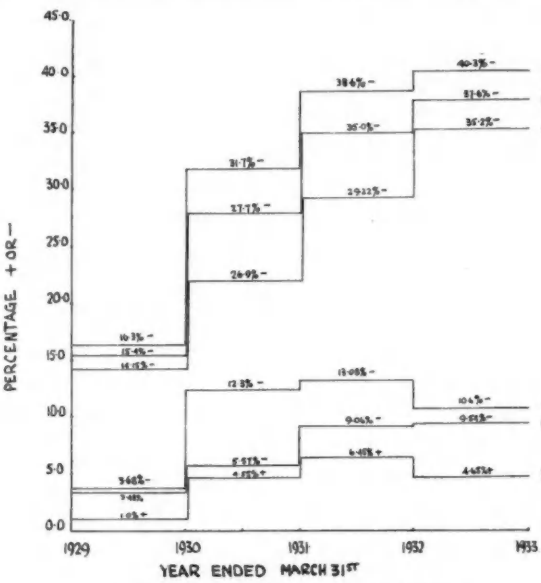
IN a paper on "Road Traffic Signalling Systems," delivered by Mr. H. J. N. Riddle, before the Junior Institution of Engineers, a detailed description was given of the "Autoflex" system in which the vehicle detector pad consists entirely of rubber moulding set in an unbreakable trough. The passage of vehicles over the pad displaces air from channels running throughout its length, and operates a pneumatic contact device. The controller comprises a series of contactor and selector relays, their operation in sequence being determined by impulses received from the detectors. The action is controlled and timed by discharge-tube timing circuits.

Efficient Generation. By T. G. Simpson

Low fuel costs or high thermal values?

THE best method of purchasing coal is by "analysis value" as generating costs cannot be kept low if the analysis and furnace values of the fuel are allowed to vary without adjustment of the price. I have found variations of 20 per cent. in analysis values on many occasions. The method outlined below is recommended, as it covers both the supplier and the purchaser in relation to thermal value received and regulates the fuel cost per kWh generated by adjusting the purchase price to meet an increase or decrease in the amount of electricity produced per lb. due to fluctuations in thermal value.

Coal samples submitted for contract should be subjected to laboratory analysis; this analysis should then be considered the standard as regards moisture, ash and calorific value for future comparison with analyses of actual deliveries. After laboratory analysis a quantity should be placed on boiler and furnace tests for final comparison with other fuels and evaporation cost tabulation. Laboratory analysis standards of sample coals submitted and accepted for contract must be rigidly adhered to; variations from standard must be adjusted according to the actual percentage variation that the contract coal attains. The method of calculation is as follows:—



Percentage reductions in costs 1929-33

1. Fuel cost. 2. Pence per kWh generated. 3. Evaporation cost per 1,000 lb. of water. 4. Per lb. of fuel. 5. Value as fired. 6. Lb. of fuel per kWh generated.

(1) Each delivery of coal should be freely sampled and tested for moisture content. The inherent moisture of coal is approximately 3 per cent. (this amount, in my opinion, should be the standard). Moisture content should be calculated with coal dried at 100 deg. C., and not on an air-dried basis. The moisture percentage difference between the standard and the coal as received should be added to or deducted from the total weight as received in the consignment under test. (2) Ash and calorific values should be corrected to the standard against the accepted contract cost per ton by the percentage difference in appreciation or depreciation that they attain on the consignment received. They should be calculated only on the "as dried" standard. (3) Test samples of consignments should be kept in sealed containers for at least fourteen days for further test comparison; in case of dispute after this period they must be accepted as correct.

The Method of Calculation

The following is an example of a calculation for fuel purchase on analysis values of cost per ton and weight correction: Standard analysis (contract sample): moisture 3 per cent.; ash, 6 per cent.; calorific value, 13,000 B.th.u. per lb.; price, 13s. per ton. Analysis of consignment (at generating station): weight in crane, 40 tons; moisture, 6 per cent.; ash, 8.15 per cent.; c.v., 12,500 B.th.u. per lb. Correction for moisture 3 per cent. above standard: 40 tons minus 3 per cent.; corrected weight, 38 tons, 18 cwt.; corrections for ash, 2.15 per cent. above standard and for c.v., 3.85 per cent. below standard: 38 tons 18 cwt. at (13s.−6 per cent.), 12s. 2½d. per ton. Saving in cost on 40 tons (by analysis) = £2 5s. On a 60,000-ton annual contract the loss would otherwise have been approximately £3,000.

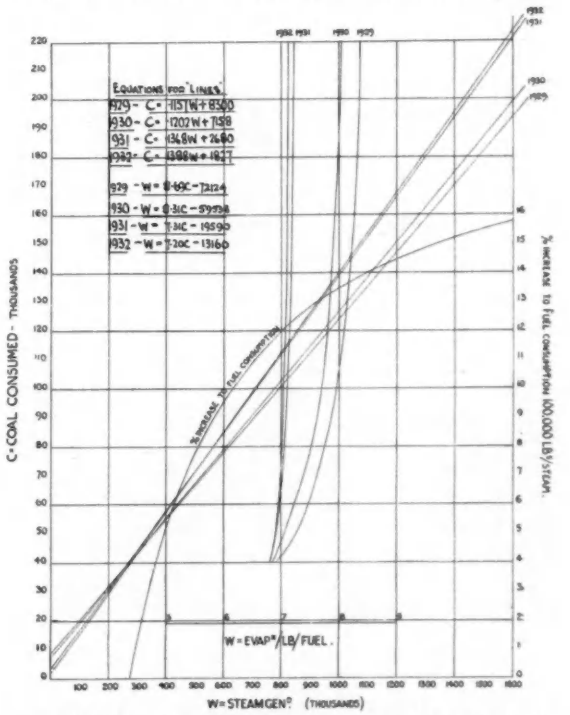
Mr. T. G. Simpson, A.M.I.E.E., is generation superintendent in the Blackburn Corporation Electricity Department

Analyses have frequently shown an ash content increase of 15 per cent., with corresponding decrease in calorific value. Moisture collected during transit of coal from pit to consumer, if exposed, is generally paid for as coal, unless correction be made on the above lines. Calorific value is also materially altered by moisture content increase; this would be corrected by analysis on the "as dried" standard.

If increase in ash content is not corrected against cost per ton, combined with calorific value depreciation, it will be charged not only against the pence per kWh, due to lower thermal value and higher fuel consumption, but in increased handling and maintenance charges to boilers, &c.; it is therefore a double charge to generation. Ash and calorific values nearly always vary in direct proportion.

In the method described, the moisture in coal, as received, is calculated against a standard, and the weight is corrected as received at the generating station. Losses due to moisture are more pronounced on washed fuels—especially if these are not allowed to drain before delivery; 15 per cent. moisture content has frequently been noted. Fuel purchase by "analysis" correction removes the risk of adulteration with a lower grade than that originally submitted. The cost per ton has varied on analysis correction by 30 per cent. for the same type of fuel.

This method of fuel purchase also locks the fuel cost per kWh to the primary figure obtained with the standards of all the fuels selected for contract, providing overall thermal efficiency remains the same. Selection should be carefully made by furnace tests and evaporation cost comparison taken by actual boiler tests. Selection of fuels by laboratory tests is not sufficient.


Equations for Lines.
1929 - C = 1151 W + 8300
1930 - C = 1202 W + 7158
1931 - C = 1348 W + 2440
1932 - C = 1398 W + 1827
1929 - W = 0·69C - 7212·4
1930 - W = 0·81C - 5959·8
1931 - W = 1·34C - 19890
1932 - W = 1·20C - 13160
C = COAL CONSUMED - THOUSANDS
% INCREASE IN FUEL CONSUMPTION PER 100,000 LBS. STEAM
W = EVAPN LB/FUEL.
W = STEAM GENN (THOUSANDS)

Evaporation lines for 1929-32 with percentage rise in fuel costs per 100,000 lb. of steam

The foregoing covers the primary factors for holding generation costs on fluctuating fuel values. It now remains, after selecting the fuels to be used, to find the average boiler and furnace efficiencies with the evaporation cost. These results may be taken as the standards to be maintained on the boiler plant.

Boiler and furnace efficiencies may fall with the use of cheaper and lower grade fuels, but not in direct ratio. The percentage decrease in cost per ton gave a lower evaporation cost, notwithstanding a higher fuel consumption. Tests taken over three years at a medium-size generating station with boilers having an evaporative capacity of 420,000 lb./hr. demonstrate this point clearly. Analysis of the results obtained show that to maintain high boiler efficiencies by the use of high-grade fuels is an expensive luxury. High evaporation per lb. for fuel with a corresponding high boiler efficiency may be achieved only at the expense of lower commercial efficiency.

A point is reached at which a reduction in evaporation per lb. of fuel by decreasing the thermal value and quality of fuel becomes uneconomical. Difficulties are encountered due to high ash content, resulting in increased stoker maintenance costs. Unless carefully watched, the limiting point between evaporation cost reduction and fuel cost per ton may be passed, the evaporation cost increased in higher ratio than a cost per ton decrease.

A Substantial Reduction

In a station under my supervision fuel costs have been decreased by 35 per cent. within three years. The increase of ash content from 11.5 per cent. to 18.4 per cent. did not cause any appreciable rise in handling and maintenance costs; they should not if the right types of fuels are selected and furnace conditions are carefully noted. The reduction in fuel costs far outweigh any small increase in costs that can be attributed to the use of low grade fuels. Decrease in evaporation per lb. of fuel is pronounced, but the increase to commercial efficiency by a 21.9 per cent. reduction in evaporation cost is considerably more noticeable.

If the steam generated were increased to 2,000,000 lb. per eight-hour shift (see accompanying graph) the increase in fuel consumption would be 16 per cent., or 13.8 tons on a total consumption of 125 tons, costing 11s. per ton, compared with 19s. in 1929. The fuel consumption increase at the higher steam generation tends to a limiting value of 16 per cent. Between 300,000 and 400,000 lb. of steam the fuel increase is 4 per cent. and at 1,500,000 to 1,600,000 lb. it is only 0.28 per cent. The graph shows that fuel consumption does not increase in direct proportion to the steam generated, as combustion conditions are found to be better at the higher evaporation.

The foregoing only appertains to the boiler plant under review, with the types of fuel selected and in use at that plant. For maintaining operating efficiency the best method is to compare steam and coal consumption every eight hours with a definite and predetermined standard derived from the coal and water line equations for twelve months.

Assuming a standard coal-line equation of $C=14{,}750+1.520K$ with an average calorific value of fuel as fired for the period of 11,250 B.th.u. per lb., correction to 10,000 B.th.u. per lb. would modify the equation to $C=14{,}750+1.702K$. If the coal has a lower thermal value than 10,000 B.th.u. per lb., the equation should be corrected to the lowest calorific value expected.

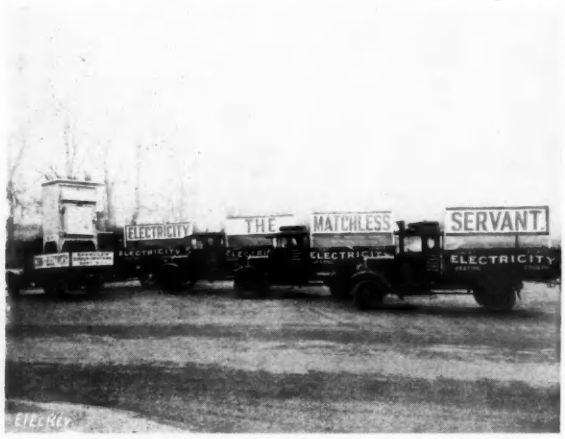
As an example, assume 80.6 tons (180,300 lb.) of coal with c.v. of 10,700 B.th.u. per lb. were used on a shift to generate 98,600 kWh; lb. of coal per kWh $=(180{,}300-14{,}750)/98{,}600=1.68$. Correcting to 10,000 B.th.u. for comparison with standard (1.702) we get $1.68\times10{,}700/10{,}000-1.797$ lb. The difference is 5.3 per cent. above standard.

For isolating the cause of an increase in fuel consumption, a steam consumption standard should be set, *e.g.*, $W=62{,}500+12.937K$. If the steam required for the shift was 1,350,000 lb., the equation would be $(1{,}350{,}000-62{,}500)/98{,}600=13.06$ lb. per kWh, which is 0.95 per cent. above standard (12.937). This represents an increase of 12,800 lb. of steam, which at an evaporation of 7.5 lb. per lb. of fuel means a loss in fuel of 0.76 tons.

This calculation shows whether an increase in fuel above standard is due to turbine or steam auxiliary inefficiency. If steam consumption is found to be approximately standard, any rise in the amount of fuel may definitely be attributed to faulty boiler operation, either wasteful firing or boiler inefficiency. It has been found that the methods described have been invaluable in holding operation results to standard. Careless plant operation and inefficiency are at once noticed and losses are limited to eight hours.

Electricity Supply Progress at Nottingham

DURING 1933, the progress shown by the Nottingham electricity undertaking in the past few years has been steadily maintained. The North Wilford power station, which is one of the "selected" stations connected to the Central England section of the National grid scheme, commenced to supply to the grid in July last. Mr. C. H. Lake, the city electrical engineer and general manager, informs us that the electrical energy generated for the year was 121,624,620 kWh,



The transport fleet of the Nottingham Electricity Department in an advertising parade

an increase over 1932 of 25,841,280 kWh, equivalent to 27 per cent. The maximum load for the Nottingham area, recorded at the station in 1932 was 35,325 kW; this rose to 40,800 kW in December, 1933.

The distribution department has also been busy, sixteen new static and two rectifying sub-stations having been put into commission during the year. In addition nineteen miles of l.p. mains have been laid in the city, and forty miles in the added area. The total mileage of distributing mains at the end of 1933 was 493. Mains have been laid in every street in the Nottingham area where property is erected.

The assisted wiring scheme was extended to the added area in February, and at the end of the year, 4,482 consumers outside the city boundary had been connected under this scheme. In addition, a further 4,918 consumers were connected within the city, the total number of assisted wiring consumers at December 31st being: city, 33,256; added area, 4,482; total, 37,738. The wiring of houses under the assisted wiring scheme outside the city was put out to tender, and the contract was secured by a local member of the E.C.A. New consumers, other than "assisted wiring," are being connected to the mains at the rate of approximately 70 per week, and the total number of new consumers for the year was 12,770, with a connected load of 22,320 kW. Of this figure, industrial load accounted for 3,290 kW, and domestic, 19,030 kW. The total connected load on the undertaking is now 154,282 kW, and the total number of consumers is 80,283.

Electric cooking is becoming more and more popular with the public, and at the end of 1933 a total of 6,209 cookers were on hire from the Corporation, an increase of 1,575 for the year. In October a new cooker (known as the "Nottingham") was offered for hire, and this particular type is proving a big attraction, 415 having already been applied for. Electric water heating and tubular heating are also proving "good sellers," and during the year the first electrode boiler in Nottingham for "off-peak" water heating was put into commission in one of the largest local stores. This plant also supplies conditioned air and is one of the most up-to-date types to be installed in the country.

Electric vehicles also seem to be gaining ground, and several "night charging" plants at a low tariff have been coupled up. One large firm in the city has ordered six vehicles for trial and if these are successful, consideration will be given to changing over an entire fleet of 100 vehicles to electric transport.

Showrooms to be Extended

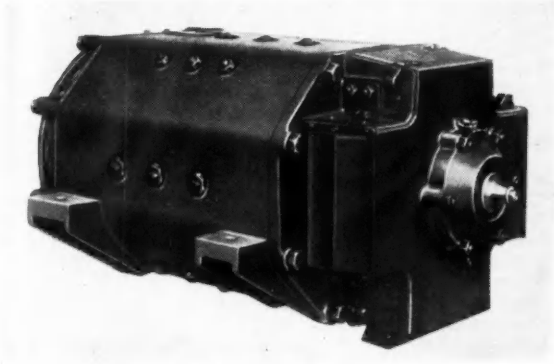
Owing to the large amount of business transacted at the showrooms, it has been found necessary to extend the premises, and when these are completed the showrooms will be twice as large as formerly and will contain a cooker demonstration room to seat 100 people. The domestic tariff (15 per cent. of the rateable value plus ½d. per kWh) continues to gain many adherents. The total number of consumers who have adopted this method of charging is now 8,341.

An advertising parade of the Department's transport fleet was arranged for the first week in 1934, and this attracted a good deal of attention to the activities of the undertaking. The "run" lasted for about one hour per day and covered the whole of the main residential districts in the area of supply, both inside and outside the city. The chief feature was a large model cooker mounted on one of the lorries which cruised slowly through the streets.

Birmingham Trolley-buses

FIFTY six-wheel double-deck trolley-buses, said to be the largest number of such vehicles ever ordered, have just been put into service by the Birmingham Corporation. The chassis were built by Leyland Motors, Ltd., and the electrical equipment by the General Electric Co., Ltd.

The driving unit consists of a single, series-wound field-controlled electric motor, with a high-permeability steel-fabricated box frame. Its one-hour rating is 65 h.p. at 500 V. The four adjustable brushholders each contain one carbon brush. The windings are cooled by a parallel-flow fan mounted on the armature, and the roller anti-friction type bearings are grease lubricated. The motor is normally mounted towards the centre of the chassis, thus enabling a short propeller shaft to be used and leaving ample room for the accommodation of auxiliary control gear on the chassis frame.



The 65-h.p., 500-V trolley-bus motor

The control gear consists of a foot-operated master controller actuating a bank of electro-magnetic contactors; the currents carried by the master controller are merely those required to actuate the contactors. The controller contains also the reverse drum, thus simplifying the wiring and avoiding electrical interlocks.

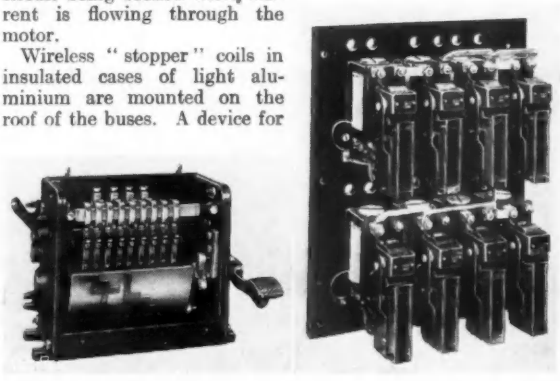
No gears or connecting links are employed to transmit the motion. The master drum is provided with adjustable spring fingers having renewable contacts and is carried on ball bearings in the upper part of the controller, the reverse drum being mounted below. Mechanical interlocking between the two drums prevents the operation of the reversing switch unless the foot pedal is "off."

The main and series field-weakening contactors are all of one type, and are similar in design to those used in railway service. The contacts are closed by vertically mounted solenoids and are opened by gravity supplemented by spring action. A wiping action is provided to keep the controls clean and arc chutes with strong magnetic blowouts are fitted. For testing, the contactors can be operated from the master controller with the vehicle stationary by closing the control switch and leaving the circuit-breakers open.

The main resistances of the unbreakable, jointless and rustless type are mounted towards the front of the chassis; their rating permits driving at low speeds in foggy weather without their being overheated. Two automatic overhead circuit-breakers, with contactor-type mechanism and magnetic blowouts, are fitted, one on either pole. They may be adjusted over a wide range of settings. Auxiliary circuits are protected by separate cartridge fuses; main auxiliary fuses are further provided, each circuit being thus double-fuse-protected.

The trolleys comprise two low-type Brecknell-Willis trolley bases with "Timken" taper roller bearings and "Tecalemit" lubricators. For running on tramway routes, where the second overhead wire is not available, a skate, consisting of iron beads mounted on a flexible wire cable, trails in the groove of the tramway rail. Its plug can be inserted or withdrawn without danger of the operator coming into contact with live metal. The skate change-over switch is operated by the reverse key of the controller, so as to prevent the power circuit being broken while current is flowing through the motor.

Wireless "stopper" coils in insulated cases of light aluminium are mounted on the roof of the buses. A device for detecting any leakage of current to the metalwork of the bus is fitted. A neon lamp placed in a suitable position in the driver's cab lights up as soon as the trolleys are put on the wires. The totally enclosed motor for driving the exhauster for the power brake is automatically switched direct on to the line. The exhauster is flange-mounted on the end plate of the motor.

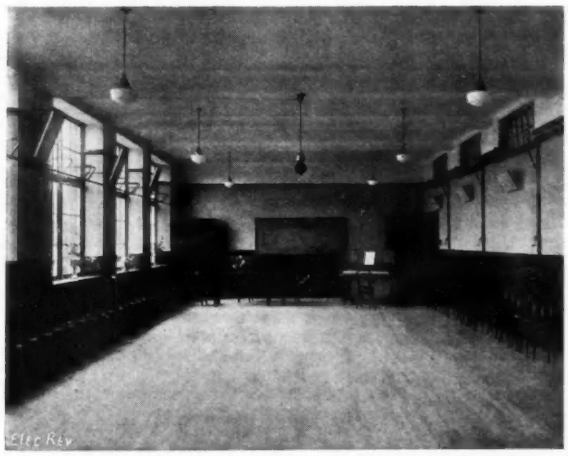


Foot-operated master controller and (right) the contactor panel

The Heating of a Modern School

THE new Moffat Academy at Dumfries has five classrooms on the ground floor and seven on the first floor. The main block is heated on the "Unity" system, with "Morganite" panels on the walls at approximately seven feet above the floor; the heating of the corridor is by "Unity" tubular heaters, and of the cloakrooms by tubular heaters fixed to the coat racks.

Each classroom is equipped with a local distribution board which is automatically controlled through a pilot circuit, consisting of an eupatheostat (comfort thermostat) and Reyrolle contactors. The eupatheostat closes the pilot circuit on the Reyrolle contactor, which in turn closes the circuit to the heating distribution board concerned. Pre-selection of the temperature required in any individual room is accomplished by setting the control of the contactor; the heating of any room can be isolated by a 5-A switch. Each classroom is heated by seven panel radiators. The assembly hall is heated by fourteen panel radiators, supplied from a three-phase, four-wire distribution board. Control is by one eupatheostat and a three-phase contactor.



The assembly hall at the Moffat Academy, Dumfries

The heating installation of the main and technical blocks is fed from a main distribution board through a three-phase, oil-immersed, motor-operated 325-A circuit-breaker controlled by a time switch which switches on the heaters at 7.30 a.m.; they are switched off at 12.30 p.m., on again at 1.45 p.m., and off for the day at 3.30 p.m. For evening continuation classes and on pre-selected days the clock operates again, but it does not switch on the heating on Saturdays and Sundays. An intermediate switch closes the motor circuit of the 325-A switch if the time switch should fail. Three twelve-gall. water heaters, with automatic temperature control, provide a constant supply of hot water, two being of the closed-pressure type, and the other of the open-pressure type.

This installation has a total loading of 790 A at 230 V, and is balanced across the phases. Approximately 7,000 ft. of Simplex conduit, and five and a half miles of Henley cable were installed.

The lighting of each classroom is by four 100-W opal units. A single 100-W opal unit lights the rector's room, which is also equipped with one 5-A plug point for desk lighting. The

heating of this room is by three 15-ft. lengths of tubular heaters (60 W per ft.) and a radiant electric fire. Adjoining the rector's room is his cloakroom, which contains one of the three twelve-gallon water heaters for supply to all staff wash-hand basins. A similar heater is installed for the janitor's use in a nearby room, the third heater being in the cleaners' room. The lighting of the male staff room is by one 100-W opal unit, and the heating by a 2 kW radiant fire. Plain pendants with 60-W lamps are used for the lighting of the cloakrooms, and 100-W opal units for the corridors.

Tubular heaters are installed in the medical rooms, where the lighting is by 100-W opal units. Similar lighting is used for the female staff-room, which is heated by a 3-kW radiant fire. The science, art, and domestic science rooms are equipped with "Morganite" panel heaters, and the lighting is by Benjamin bi-reflectors, with 150-W lamps. The domestic science room is equipped with suspension plugs for electric irons and with a 5-kW electric cooker.

The academy buildings were designed by Mr. J. R. Hill, who, in the electrical portion of the scheme, was assisted by Mr. J. S. Pickles, the County of Dumfries electrical engineer. The electrical contractors were Messrs. McCowan & Guild, and the clerk of works was Mr. W. S. Elliott.

The supply is taken from the Dumfries Corporation mains at 11 kV, and is transformed to 400/230 V by a 200 kVA Bruce Peebles' transformer. The h.v. side is controlled by Crompton Parkinson switchgear, and the l.v. side by a Henley unit-type pillar, whence the mains pass through a three-phase, 300-A B.T.-H. circuit-breaker to provide the supply for water heaters, lighting of staff rooms and cooking.

Electrical Equipment in a Mines Rescue Station

IN the new Lancashire and Cheshire Coal Owners' Mines Rescue Station at Boothstown, inspected by the Duke of Gloucester on January 18th, electricity is used extensively not only in the running of the station itself and the handling of emergency calls but also for cooking, water heating, and other domestic purposes in the homes of the superintendent, trainers, and men of the two permanent rescue corps. No gas supply has been provided.

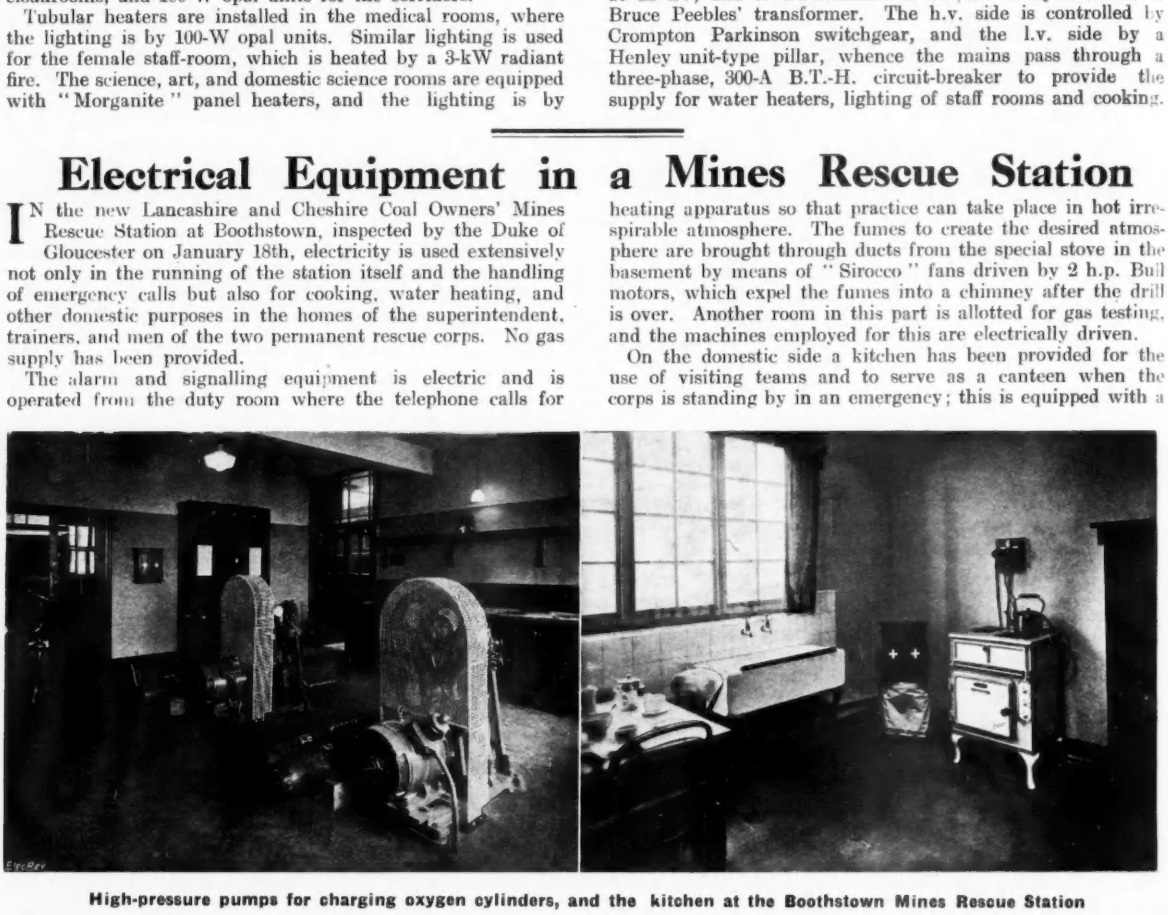
The alarm and signalling equipment is electric and is operated from the duty room where the telephone calls for aid are received from affiliated collieries. Two telephone lines are provided to the public exchange and an inter-communicating telephone system manufactured by Ericsson Telephones, Ltd., enables internal calls to be put through to the two instructors' houses and to the various parts of the station. Immediately a warning message is received the duty man presses a push, whereupon a special contactor energises a solenoid which lifts catches, automatically releasing the garage doors, which instantly swing open. The same contactor rings alarm bells in the homes of the men of the corps, and in the station and garage where hooters are also instantly sounded by the same operation. Another contactor push operates a 4-h.p. Gent "Tangent" syren on the roof of the station.

A master lighting switch in the duty room operates the flood-lighting in the garage and also controls twenty lights in the vital departments and corridors. This pilot lighting is supplied directly from the mains and not through the ordinary switchboard. The ironclad switchgear, with bus-bar chamber and meters, &c., for the supply of electricity for general lighting and power purposes is housed in a cubicle in the basement. To maintain a stand-by skeleton electric lighting system in the garage and other important parts of the premises, a charging panel and accumulator plant are provided, using "Exide" batteries.

An Artificial Atmosphere

Three high pressure pumps, each provided with a 4-h.p. Bull motor, for charging the oxygen cylinders which the rescue men carry strapped on to their backs are situated in the cleaning and repair rooms, where electrically driven lathes and grindstones are also installed. The station's research laboratory is equipped with plug points for electrical appliances. An aviary for birds used in rescue work is illuminated by a pilot light as well as by the general lighting system. One of the two training galleries, which are laid out to represent the underground workings of a mine, is provided with a special heating apparatus so that practice can take place in hot irrespirable atmosphere. The fumes to create the desired atmosphere are brought through ducts from the special stove in the basement by means of "Sirocco" fans driven by 2 h.p. Bull motors, which expel the fumes into a chimney after the drill is over. Another room in this part is allotted for gas testing, and the machines employed for this are electrically driven.

On the domestic side a kitchen has been provided for the use of visiting teams and to serve as a canteen when the corps is standing by in an emergency; this is equipped with a Jackson electric cooker and high-speed electric kettle. Plugs for light and heavy duty appliances are suitably placed in appropriate parts of the station. To ensure that there is no delay in the departure of the rescue vans owing to cold engines, "Genii" electric immersion heaters (200-W loading) are fitted to the water systems of the tenders. The houses of the superintendent, two instructors, and twelve men are each supplied with the latest lighting fittings, an electric cooker, electric wash-boiler, points for fires, &c., and an electric thermostatically controlled circulator is fitted in the hot water cylinder. The road separating these dwellings from the station itself is illuminated from the main by means of three G.E.C. opal cube fittings on reinforced concrete standards. The contractors responsible for the electrical work, including telephones and alarms, were Messrs. S. Dickinson, Ltd., and the electricity is provided by the Lancashire Electric Power Co.



High-pressure pumps for charging oxygen cylinders, and the kitchen at the Boothstown Mines Rescue Station

An I.E.E. Radio-telephone Link

AN exchange of greetings took place by wireless telephony on January 16th between the President of the Institution of Electrical Engineers, Mr. P. V. Hunter, C.B.E., speaking at the Post Office Telephone Exchange in Carter Lane, London, and Mr. F. O. J. Roose, chairman, I.E.E. Bombay Local Committee, who was speaking from the chair at a meeting of the members in the Bombay district. At this meeting a paper had, appropriately, just been read by Mr. W. H. Ashley, director of beam stations in India, on "Beam Wireless Telegraphy and Telephony." Mr. Hunter referred to the confidence with which the continued extension of the membership of the Institution in India was looked forward to, and acknowledged the assistance of beam wireless communication in strengthening the ties between them and the membership at home. The President's remarks were reproduced in the meeting room by means of a public address system. These arrangements were made possible through the courtesy of the Engineering Department of the British Post Office and the Indian Radio and Communication Co., Ltd.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Encouraging the Inventor

A SYMPOSIUM of papers on invention was presented at a meeting of the INSTITUTION OF MECHANICAL ENGINEERS on January 19th. Mr. H. W. Dickenson, dealing with the "Evolution of Invention," differentiated invention from discovery, the latter being the apprehension of the order of nature and the latter its guidance into new channels. Discovery was made apart from the idea of possible utilisation, whereas invention was evolved for a specific purpose.

England furnished the first known example of encouragement to the introducer of a new process by the grant of letters patent in 1440 for a method of salt manufacture. The Statute of Monopolies, 1624, was the basis of our present patent system, and the author considered that, despite its drawbacks, it undoubtedly provided the best system for fostering invention.

The greatest credit was deserved by the man who incurred the hardest part of the labour in bringing an invention to a successful issue, and the application of many minds was usually necessary to carry an idea from inception to practical use. There was scarcely an exception to the rule that the best inventive period lay between twenty-five and forty years of age. A mechanical movement to replace human or animal labour should not imitate nature, which worked reciprocatively, whereas the machine worked rotatively.

The Patent Situation

Mr. H. S. Hatfield, speaking of "The Inventor," said that a valid patent must be more than a product of simple skill. Conscious thinking out could not produce new forms of devices, and the best technical brains might not produce new ideas, which often came from apparently inferior minds. We were living in an era of inventive activity due to the presence of a leaven of creative minds in a population with an appetite for novelty. Leaders of industry should select problems for solution and offer the inventor the incentive of a financial share in the success of his work, but should not make him a salaried official with routine hours, as most of his best work was accomplished in violent bursts of overwork generally at high pressure.

Some notes on "Provisional Patent Protection and Patent Claims" were contributed by Sir William S. Jarratt (formerly Comptroller-General of Patents), who warned the inventor who relied on provisional protection not to divulge his invention lest publication should invalidate subsequent application for a patent, especially if the date of application were postponed. He suggested that a provisional specification should contain a broad statement of the nature of the invention and a clear description of its best exemplification known at the date of application, but not a statement of claim which might do harm to the scope of the monopoly.

The inventor had to compromise between his conflicting wishes to make the scope as wide as possible and to specify in detail what he regarded as essential for making an adequate reply to a competitor. Since 1919 an inventor could succeed in an action for infringement even if his specification contained an invalid claim, provided he could prove that the latter was framed in good faith and with reasonable knowledge.

Sir William commended the action of the Institution in establishing a standing committee to consider inventions (provided patents had been applied for) submitted by its members. In this they followed a precedent set by Government Departments.

Mr. A. H. Gledhill, discussing "The Development and Exploitation of Invention," emphasised the need for simplicity in design, to which the commercial success of many patents was due. He recommended the taking out of a provisional patent as soon as the idea had taken definite form, as others might be working in the same field. Publication of the idea would invalidate the patent, but this would not apply to disclosure to workmen.

Within twelve months after the filing of the provisional specification a complete specification must be filed with drawings and details. He advised the purchase from the Patent Office of the Abridgements of Specifications, appertaining to the appropriate one of the 146 classifications, and then to buy (for 1s. each) specifications of patents that appeared to be on cognate lines.

The Transmission of High-voltage Direct Current

SOME aspects of the electrical transmission of power by direct current at high voltage, the subject of Mr. H. Rissik's paper which was referred to last week, were discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 18th.

Mr. W. E. Highfield said it was impossible for those who had not seen the series d.c. system at work to realise its simplicity and safeness. The parallel system—whether a.c. or d.c.—had to suffer extremely severe shocks under short- and open-circuit conditions, whereas with the series system the e.m.f. varied with the load so that the average stress during the day was very much less than the maximum, and the variations were slow and regular. The current was constant and under short-circuit conditions it was still normal. There were no switching surges because no switching was done in the ordinary sense, so long as each generator was equipped with a slow moving short-circuiting switch. Personally he did not think any other system would be devised which would be so safe from these points of view.

The series system could be carried overhead and also underground at a very moderate cost. The arc rectifier would undoubtedly lead to further experiment and research, but he felt there was still a long way to go before the d.c. parallel system could be universally adopted. There was a future for d.c. for transmission; with a perfect a.c. generator and a perfect d.c. transmission line, surely it was logical to continue researches along the lines indicated in the paper.

Mr. J. R. Beard said that the paper did not throw very much new light on the subject. Spectacular progress was not likely to be made during the next ten years. The paper carried things a little too far at the moment. For instance, what definite data was available with regard to cable insulation in damp atmospheres? He had his doubts in this connection concerning what the author had put forward.

Two views of the new municipal baths at Poplar which were formally opened on Monday last. **Some notes on the baths appear on page 135**

Mr. T. N. Riley remarked that the statement that, as in d.c. transmission no dielectric losses occurred, insulating materials could be stressed many times more severely than with a.c. was liable to give rise to misunderstanding. Great progress had been made with means of preventing ionisation in a.c. cables, but with d.c. cables moisture transferred through the dielectric might give rise to difficulties in service. For pressures higher than 200 kV there would have to be a different kind of insulation.

Dr. W. G. Thompson suggested that the paper would have been more interesting if the author had also given a survey of the invertor in relation to this problem. He referred to experiments which he and others had carried out with the object of investigating the comparative values of corona loss with d.c. and a.c. and mentioned the possibility of electro-endosmose, which Prof. Thornton had suggested was due to negative ions moving towards the positive core of the cable and setting up motion of the moisture film in that direction. Stability did not refer merely to the transmission line, but to the whole of the connected apparatus, and so far they had very little knowledge of how the invertor behaved when the power fluctuated. The atmospheric arc valve as designed by Dr. Marx really involved no new principles.

Mr. W. M. Mordey recalled that Lord Kelvin never swerved from the view that the future electrical transmission would be by d.c. Lord Rayleigh had also expressed the view that a.c. mathematics would send everybody back to d.c.! Prof. J. T. McGregor-Morris said the crux of the problem was that in the Thury system the current was maintained constant, and therefore the line losses were constant. It would be worth considering whether the voltage at which d.c. generators worked might be increased by their use in a compressed gas. The copper oxide rectifier was another possible competitor which had made marvellous strides. At the Physical Society's exhibition there was an example which would go up to 100-kV.

Major A. M. Taylor said that everybody had been trying to eliminate the reactive drop from a.c. lines by putting down phase rectifiers at intervals to pull the power factor back to unity. Nobody, however, seemed quite to have realised that these rectifiers or synchronous condensers were very expensive. He associated himself with Mr. Beard's suggestion that there was a long way to go before the end of a.c. transmission was reached. Was there not a means of making a.c. transmission very much cheaper by the use of static tap-regulated transformers, automatically controlled, to inject a boost which would nullify the reactance in the line and keep the power factor at unity? Mr. A. Page expressed the view that the author had shown very forcibly that most of the advantages were with d.c. At the same time it could not be said that d.c. transmission did not present some serious problems. For instance, how would one set about metering a huge d.c. supply at 500 kV? The a.c. system had one master card only, *viz.*, the transformer.

The author, in reply, said that if any real advance was to be made with d.c. transmission it would result from experiment of some kind, and there was encouragement from the success that had been obtained on the Moutièrs-Lyon scheme. If rectification were used, which seemed inevitable, the switching problem had already been solved in that the rectifier of whatever kind was capable of acting as its own circuit-breaker. A rectifier at present operating in Germany consisted of a 3,000-kVA static frequency changer which supplied power to the German State Railway system at 15,000 V, single phase, 16⅔ cycles, from the industrial 50-cycle network. This had been operating for some six months; it apparently gave great satisfaction and was capable of supplying power in either direction. There would be no real difficulty in constructing an invertor set of any reasonable magnitude.

Diesel-engine Operation

THE report on heavy-oil engine working costs submitted at the last meeting of the DIESEL ENGINE USERS' ASSOCIATION relates to fifty-four generating stations (twenty overseas). As an offset to a reduced number of returns from home stations there is an increase in the overseas section.

Figures are included from the Broken Hill (N.S.W.) station, which is the largest plant (23,000 b.h.p.) yet included in these reports. The annual station load factor is 30.8 per cent., which is high for a local peak-load station. Reducing costs of fuel and lubricating oil to the average of the home stations, the costs in pence per kWh generated are: fuel, 0.196; lubricating oil, 0.004 (7,900 rated b.h.p.-hr. per gal.); stores and water, 0.010; wages, 0.027; repairs and maintenance, 0.019; total, 0.256. The B.th.u. per kWh were 11,500.

The supercharged engine has not made the progress expected two years ago, but at Ashford, with a running plant load factor of 61.1 per cent., the percentage of the output generated by the supercharged engines was 64.4 compared with 39.0 in 1930/31, the average fuel consumption being reduced to 0.597 lb. from 0.666 lb.; the present figure is 10.8 per cent. below the "standard" fuel consumption curve adopted by Mr. C. O. Milton. New engines installed were one 225-b.h.p. air injector, one 225-b.h.p. two-stroke, and one 400-b.h.p. mechanical injector (high compression).

The average station load factor was 12.75 per cent. The total kWh generated was 138 millions (94 millions overseas), of which 54 per cent. was produced by thirty-five engines of from 1,000 to 3,000 b.h.p. The aggregate capacity of all engines was 83,000 kW (43,000 overseas). Fuel per kWh generated was 0.648 lb. at an average plant load factor of 67.2 per cent., falling below the standard for the first time. Converted at 19,500 B.th.u. per lb. the consumption corresponds to a thermal efficiency of 28.9 per cent. The standard of 2,380 rated b.h.p.-hr. per gal. of lubricating oil was exceeded by twenty-four stations.

The average engine costs in pence per kWh generated by home stations were: fuel, 0.216; lubricating oil, 0.034; water and stores, 0.012; running wages, 0.129; repairs and maintenance, 0.087; total, 0.478. For overseas stations the figures were, respectively, 0.381, 0.038, 0.012, 0.076, 0.065, and (total) 0.572. Each item of cost was lower than in the previous years, the aggregate reduction being 8 per cent. The average cost per ton of fuel oil was 62s. for home and 110s. 4d. for overseas stations. Lubricating oil cost 2s. 6d. and 3s. 10½d. per gal.

Repair and renewal costs over eleven years have averaged 0.284d. per kWh generated, excluding the stations of the Charing Cross Co., Southend, and Crompton Parkinson, where special conditions prevailed. Including these the overall average figure becomes 0.037d.; at the Crompton station the amount over the whole period works out at 0.0029d. per kWh.

The Rising Generation

VERY satisfactory results have attended a number of electrical exhibitions held by the Lancashire Electric Power Co. during the past few months in a number of townships with populations ranging between 7,000 and 16,000 and in various rural and farming districts. Four-day exhibitions were held in each case. The places visited included Ramsbottom (four miles from Bury), where cotton manufacturing, calico-printing, and engineering are prominent activities; Westhoughton, Haydock and Golborne (five or six miles from Wigan), the industries of which include cotton, artificial silk, and collieries; Whitefield and Walkden (some six to eight miles from Manchester), with cotton manufacturing interests and residential districts; and Tyldesley, a town with cotton manufactures and collieries, five miles from Bolton.

At the Leyland, Bamber Bridge, and other exhibitions in farming areas, which incidentally concluded the 1933 series, a special feature was made of electrical appliances for farming, including poultry incubators and brooders, portable motors, &c. Cooking demonstrations were held at all of the exhibitions in the afternoons and evenings.

A new feature much commented upon was an electric water-heating exhibit, comprising a model bathroom, including a converted hot-water cylinder in the usual cupboard, bath, and hand-basin with storage tank. The immersion heater was, of course, in operation to make it a working exhibit, and to overcome the difficulty of the absence of a waste outlet for the bath water an electric motor was installed in the cylinder cupboard, which pumped the water from the bath back into the cylinder after a demonstration. The whole model was, therefore, easily portable and self-contained. Advantage was taken of the interest which it aroused to deliver brief lectures explaining the advantages of electric water-heating.

By means of personal invitations to consumers, Press advertising, posters on hoardings, lantern slides at cinemas, and door-to-door distribution of thousands of handbills the districts were effectively prepared for the arrival of the exhibition. Official openings by local councillors enabled the Press to be invited and good editorial support was thereby obtained. Invitations were sent to the school authorities in each district offering to arrange a special session of the exhibition for the benefit of the senior classes. This offer was generally taken advantage of and at most of the exhibitions the scholars were shown round the exhibition and electric cooking and appliances were demonstrated.

More than 5,000 people visited these exhibitions and nearly 1,000 boys and girls from the senior classes of the schools referred to were present at the demonstrations and at lectures on the principles and applications of electricity.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Ilford Contractors and Lamp Sales

I am desired to acquaint you with the following resolution agreed upon by this Association at a meeting held on January 17th, when the question of the terms of the agreement with the Electric Lamp Manufacturers' Association for the sale of Elma lamps was raised.

"That it be an instruction to all members to refrain from entering into any further agreements with the Electric Lamp Manufacturers' Association until such time as the trading conditions between electricity supply authorities and dealers is made equitable, and that such resolution be communicated to the technical Press."

During the discussion it was disclosed that all makes of Elma lamps can be purchased at discounts below those covered by gradings; that electricity supply authorities are permitted to sell and display any make of lamp as well as Elma lamps; that competitive window displays are provided for supply authorities both by Elma members and non-Elma firms; and that the public have refused to purchase Elma lamps from graded dealers, preferring to purchase other makes from supply authorities' showrooms, thus placing the dealer in difficulties and causing heavy reductions in his lamp sales.

Ilford, *January 18th.* L. WILDE.
Hon. Secretary,
Ilford Electrical Contractors' Association.

The Earthing of an Iron

We have noted the letter which appears in the ELECTRICAL REVIEW of January 19th regarding the above, and we observe that in the case referred to, although the connector earthed the iron, it did not earth the coiled spring cable guard. We are, therefore, writing to point out that in "Premier" earthed connectors, the connection runs right through from the spring contacts, which earth the iron by pressing inside the terminal shield, back to the head of the connector and effects a good metallic contact with the coiled spring guard.

A suitably coiled spring guard will not chafe the insulation, and it is, of course, a most efficient protector, permitting only normal bending and allowing escape of heat from the flex by radiation at the part where the flex is most likely to suffer.

PREMIER ELECTRIC HEATERS, LTD.
Geo. Collins.

Birmingham, *January 19th.*

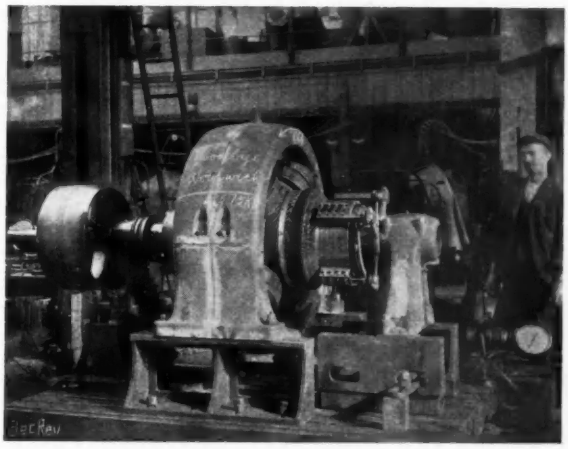
Thirty Years Ago

I am sending you a photograph taken about October (I forget the exact date), 1903, showing the last machine finished and despatched from Woolwich by Siemens Bros. Dynamo Works before leaving these works for Stafford.

This machine was regarded as very modern at that time and I remember it involved me in an all-night job testing it. The firm were still making two-pole undertype dynamos at that time, chiefly for P. & O. boats, coupled to Tangye engines. They had just begun to experiment with d.c. turbo generators.

We actually made a disc-type alternator the first year at Siemens dynamometers. They were employed as ammeters and voltmeters and were regularly in use in the early Stafford days. The first experimental high-speed generator was run at Woolwich. This was a d.c. machine driven by a two-pole induction motor.

There were many exciting days when the turbo-generators were "cutting their teeth" at Stafford, and it was good prac-



The last generator made at Woolwich by Siemens Bros. Dynamo Works

tice to put testing gear and yourself—if possible—out of the line of fire in case of accident. D.c. turbo-generators were much more trouble than a.c., and at that time were more important. E. M. KERR.

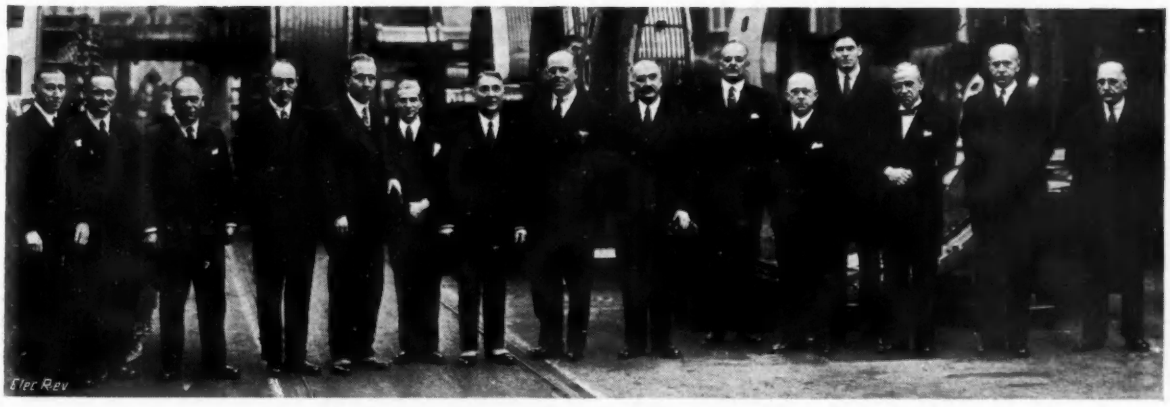
Cartmel, Lancs, *January 11th.*

Variations in Distribution Voltages

Your correspondents, with the exception of Mr. Cox-Walker, do not realise that voltage maintenance is purely a question of economics. Whilst a maximum voltage variation of plus or minus 4 per cent. *may* be economically feasible where consumers are close together, a maximum variation of plus or minus 6 per cent. is economically quite impossible where they are widely scattered, particularly if electricity is used for general heating and cooking; although it is quite possible in the majority of cases, where the prices charged for electricity are so high that heating and cooking are rendered impossible.

The conditions in large towns, small towns, villages, rural areas, and widely scattered small consumers vary so much that what is economically possible in some cases is quite impossible in others. I therefore think that the Electricity Commissioners are unwise in making a regulation which applies without variation to all these varying circumstances.

I quite agree with Mr. Cox-Walker's remarks *re* the new regulation, which dictates that loads up to 15 kW must be connected between phase and neutral. This regulation is



Latvian Delegates at the Met.-Vick. Works **(See page 131)**

From left to right: Messrs. G. Harlow, director, Met.-Vick. Elec. Export Co.; K. Baumann, director, M.V.E. Co.; J. Robinson, Mather & Platt, Ltd.; H. A. MacKay, director, Platt Bros. & Co.; A. Zalts, Latvian delegate, Ministry of Finance; C. M. Pickthall, Department of Overseas Trade; His Excellency Mr. K. Zarine, Minister for Latvia in London; Messrs. G. E. Bailey, director, M.V.E. Co.; A. Kacens, Latvian delegate, Ministry of Finance; Lt.-Col. K. G. Maxwell, M.V.E. Co.; Messrs. R. Bettman, Latvian Business Adviser; D. W. Stanley, M.V.E. Export Co.; E. Farrington, Latvian Consul, Manchester; J. S. Peck, Director, M.V.E. Co.; and T. Fraser, M.V.E. Co.

Stafford, but I do not remember seeing any more of that type made there although they were used long afterwards in the test house.

Much commercial testing, both d.c. and a.c., was done with

quite unnecessary, and makes the position with respect to voltage variation still more difficult.

Messrs. Kidd and Carr write from Manchester, and therefore I presume have no experience of giving supplies to *widely* scattered *small* individual consumers in rural areas, where the loads are usually so small that automatic regulators cannot be justified. In such areas gas is usually miles away and is not an effective competitor. They also state that a 10 per cent. drop in volts reduces the light by 35 per cent.; quite, but this is not noticed if the drop in pressure is gradual, and if the charge for electricity is low can be dealt with by installing larger lamps. The light from gas mantles often varies much more than 35 per cent. within a few minutes.

Mr. Turnbull is a man of great ability and enthusiasm with very considerable experience in rural supply. He advocates the use of tail-end boosters (I presume he refers to non-automatics). I use them myself, but the boost for which they are set is at least as great at light load as at full load, and they therefore do not reduce the voltage *variation*. He states "there is no measurable drop on the h.p." (or presumably in the transformer). Well, we would all like to know of this wonderful type of main. He also states "it is possible to supply a consumer one mile away from the low-pressure supply main with a drop of less than the old 4 per cent. allowance." If he means for all purposes and by low pressure, how does he do it? Is the voltage at every consumer's terminals within the plus or minus 4 per cent. limit?

This question of voltage variation depends very much on price. What is Mr. Turnbull's charge to his rural consumers? In my case the rural domestic consumers pay 12 per cent. on the rateable value, plus ¾d. per kWh, and therefore are anxious to use electricity for heating and cooking. If we increased these charges they would not use it for these purposes, and the difficulties regarding voltage variation would vanish.

We all agree that plus or minus 4 per cent. voltage variation or less is a desirable ideal; but as it is economically impossible in very many cases, the supply authority should be permitted to do what *is* economically possible. In my view widely scattered small consumers cannot and never will be profitably supplied for general cooking, or, except for occasional use, for heating. Voltage variation restrictions in rural areas must inevitably result in dear electricity and therefore restricted use, and this is what we all wish to avoid.

Electricity supply has always been held back in this country by unnecessary regulations, but a very necessary regulation to prevent unqualified persons putting in electrical installations has always been withheld. SUPPLY ENGINEER.

January 19th.

The New Regulations

I read with interest the new installation regulations, and can assure you that they are not too early, but I think the next thing on the board is to investigate the remuneration which the inspectors receive for seeing that they are carried out in an efficient manner.

I believe that at present their wages vary from £3 to £3 10s. per week, according to the area. Is this sufficient for the responsibility involved? ELECTRICAL ENGINEER.

January 21st.

A Prepayment Meter Problem

The problem raised by Mr. H. Wilson, the electrical engineer of Ashford, is one which had considerable attention in Croydon about three years ago. With a two-part tariff hire and hire-purchase fixed charges to consumers become out of proportion to the charge for current consumed and, when rendered quarterly, amount to a sum which the average weekly wage earner simply cannot pay. To add the fixed charges to the price per kWh and collect them through an ordinary prepayment meter only places a restriction on the use of the supply, as the consumer, having in mind the consequent high price per kWh, feels that he is economising by using as little electricity as possible. This latter method has been adopted almost without exception for assisted-wiring schemes throughout the country, and this obstacle to the free use of supply led Croydon to look for something different.

The average person to-day clearly understands the principles of hire purchase, and he is quite prepared to purchase any commodity he fancies provided the payments are sufficiently easy, and, conversely, he has to do without when it is necessary to pay cash or comparatively few instalments of a large amount. Nothing could be easier than weekly payments, but the high cost and inconvenience of weekly collections was an obstacle. The two-part tariff prepayment meters on the market were considered, but it was decided that they were too complicated to be understood by the type of consumer to be catered for, and that any doubt he might have on this score would breed a suspicion that there was a "catch."

There is still a suspicion in the minds of consumers that the standing charge of a two-part tariff is a payment for something intangible, and the advent of assisted wiring therefore gave us a splendid opportunity to combine the cost of wiring, the standing charge of the tariff, a sufficient number of kWh for lighting only, lamp renewals and hire charges (if any) in one fixed charge, leaving the running charge for kWh used in excess of those allowed for lighting to be collected as a separate charge of inconsequential amount.

It was found possible to combine all the fixed charges mentioned above (except hire rents) into a fixed charge of 1s. 6d. per week, and excess energy above the quantity allowed was to be charged for at the end of the quarter by the meter reader. Various meter manufacturers were approached, and a suitable "collector" to our specification was finally evolved by Venner Time Switches, Ltd. This consists of a standard prepayment mechanism driven by a small synchronous motor arranged to trip a switch in a predetermined time. The insertion of a shilling gives supply for a period of 112 hours, so that the insertion of three shillings gives supply for exactly two weeks. Shillings may be inserted in advance to prevent the inconvenience of switching off, and, in the event of switching off due to lack of shillings, arrears are recorded, which have to be made good before supply is again available. Hire or hire-purchase payments may be included in the weekly sum and are collected by a proportionate reduction in the time period allowed for each shilling.

An ordinary meter is installed to record all consumption, the quarterly reading being adjusted for those units which are included in the fixed charge. It has been found sufficient to install a "collector" in the lighting circuit only, thus avoiding the necessity for instruments capable of dealing with a load of more than 10 A. About 4,000 installations have been wired under this scheme within the past eighteen months, the "collectors" are giving admirable service, but, most important of all, the available figures show that the average consumption per consumer is approximately three times the number of units which would probably have been used for lighting. The consumer's mind is clear upon fixed charges and he has the unrestricted use of electricity for cooking, heating or other domestic purpose at the present charge of 0.675d. per kWh in winter and ¼d. in summer. F. N. RENDELL-BAKER,

Chief Engineer and General Manager,

Croydon, *January 23rd.* Croydon Electricity Dept.

This Prosperity

"Admirer" has thoroughly misunderstood my letter. I never defined a "simple job"; in fact, I stated: "Jones may be a B.A. or a B.Sc., or a lad from Borstal or a handyman." A simple job to Jones, B.A., would not be a simple job to Jones, handyman. This, by the way, is common sense. I also stated that a thorough training was necessary to give the recipient an easy start over his less fortunate brethren who, for lack of means, work hard all day and study half the night. We all very much admire the last mentioned, and they are made of the right stuff.

I do not recommend anybody to develop an inferiority complex, but I do advise any man when he first enters the electricity supply industry with a degree to humble himself. Naturally, he will find men not so well educated as himself and lacking his advantages, but who, nevertheless, can teach him quite a lot and who, for a time at least, are worth twice as much money. I do not rate an ordinary workman higher than Faraday, but I think our extraordinary workmen, super tension cable jointers, &c., are, in their sphere of life, comparable with Faraday. I even admire a good dustman who carries out a thoroughly unpleasant and tiring job cheerfully and well. He is worth his money and should not be sneered at even by a switchboard attendant.

We all remember the two types of learned schoolmasters or lecturers. The first could keep order and demand respect, but one could throw paper at the second with impunity—directly his back was turned. The latter was generally the cleverer man, more lovable than the former, yet, alas! not worth so much in this hard and horrid world.

Bexleyheath, Kent, *January 20th.* A. J. ABRAHAM.

A Charge of Discourtesy

Two months ago I answered an advertisement which appeared in your "Situations Vacant" section, and with my letter enclosed a stamped addressed envelope in order that I might receive notification in the event of my application being unsuccessful. So far I have received no reply, and I have not seen any notice in your "Appointments Filled" section.

Surely it is not too much to expect the courtesy which is usually extended to people who reply to one's inquiries. If an individual reply is not possible, your generous offer of a free insertion under the heading "Appointments Filled" leaves the advertiser only one course to follow, if he wishes to refrain from what amounts to grave discourtesy to your readers.

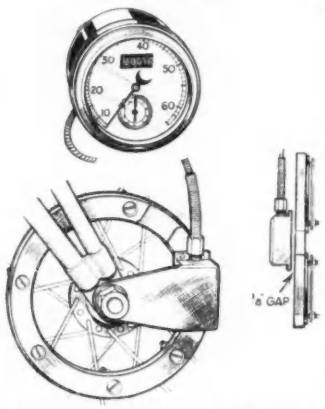
January 24th. GRAD. I.E.E.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Electric Speedometer for all Vehicles

An improved electrically driven speedometer, which, it is claimed, is suitable for operation on any kind of vehicle, has recently been introduced by MR. A. MACDONALD COX, South Heath, Great Missenden, Bucks, at £4 10s. Current is generated by a magnetised ring fixed to the wheel spokes of the car or motor cycle, and having in its field a suitable coil attached by a bracket clamped under the wheel spindle nut. The coil is totally enclosed in a watertight metal case, and there is no actual contact between the case and the magnetised ring. The latter energises the coil at every revolution, and results in an electrical impulse being conveyed by an insulated cable to the speedometer head.



The Cox speedometer and its magnetic drive. The drawing on the right shows the gap between the magnetised ring and the coil unit

The current then acts on a small electromagnet, and at every impulse pulls down a pivoted armature connected by a pawl to a small toothed balance wheel. The pulsations result in an oscillating movement being imparted to the balance wheel. This movement is then transmitted through a train of gears which reduces the oscillation, and thence to a toothed wheel to which the indicator hand is indirectly coupled by means of a tension spring. A final damping arrangement gives a steady reading of the indicator hand, even under bad road conditions. The accompanying sketch is reproduced from *The Motor Cycle*.

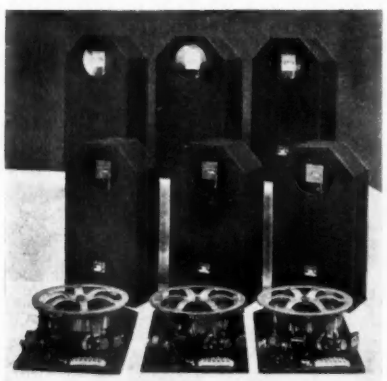
A Low-priced Fire

MESSRS. BERKELEY & YOUNG, LTD., Tyseley, Birmingham, are selling, at 17s. 6d., a small electric fire which they call the "Dinkie." Four figured marble vitreous enamel finishes are available, and a feature of the fire is that it can be fixed direct to a piece of slabbing or tiled surround without the necessity for any excavations. It will fit flush on to a flat surface as there are no projections at the back and a switch is incorporated in the centre below the firebar.

The new "Dinkie" fire

Automatic Voltage Regulation

The "I.R." voltage controller has been introduced by MESSRS. ISENTHAL & CO., LTD., Ducon Works, Victoria Road, North Acton, W.3. Its function is to enable a consumer to vary the mains voltage or to maintain a voltage that is constant within ±1 per cent., or in special cases ±0.5 per cent. It is submitted that its field of application is not confined to research laboratories or testing stations, but that it can be applied for domestic loads.



"I.R" voltage controllers

The apparatus consists essentially of a closed magnetic-ring transformer with its primary connected to the supply mains. The insulation of the secondary, which is connected to the load, is stripped where necessary to form a bare copper track from which a carbon roller can collect up to 25 A. Heavier currents can be dealt with by employing an auxiliary transformer with a ratio of two to one, the secondary of which is connected *via* a change-over switch with the secondary winding regulating the former; the primary windings of the two transformers are connected in parallel.

The carbon roller is carried by a spur wheel driven by a pinion, which may be hand-operated by crank or gear driven by a 13-VA high-speed commutator motor. The motor is series wound, the two field coils acting in the opposite sense to permit reversal.

Automatic operation of the regulator can be obtained by using a voltage relay connecting two solenoid-operated mercury switches controlling the motor field. The regulating range can be doubled in all except the smallest sizes by a change-over switch, which connects the two ends of the secondary windings to the mid-point of the primary winding, unless an auxiliary transformer, as mentioned previously, is employed.

Prices range from £10 10s. for the smallest size to £227 for the 7.5-kVA model.

A Mains Disturbance Suppressor

The "Belling-Lee" disturbance suppressor is designed in accordance with the Post Office recommendations to silence h.f. interference with radio reception other than that due to atmospherics or mains hum. It can be fitted either at the listener's main switch, where it by-passes high-frequency disturbances before these are transferred to the house wiring, or it can be installed at the source. The suppressor comprises two 2μf condensers with centre points connected to a shrouded earthing terminal, the outers being taken through a pair of 1-A fuses to terminals for connection to the supply mains. Fuses are carried on the lid of the box and thus break circuit when this is opened.

The "Belling-Lee" mains-disturbance suppressor

The unit is designed for pressures up to 450 V d.c. or 250 V a.c., and is tested at 1,500 V. The p.f. of the condensers, which are constructed in accordance with I.E.E. and B.S.I. requirements, is about 0.003 and the minimum resistance is 1,000 megohms. The energy taken is too small to be registered if the earth resistance is low. The suppressor is produced by MESSRS. BELLING & LEE. LTD., Cambridge Arterial Road, Enfield, at 10s. 6d.

In extreme cases it may be desirable to fit a pair of chokes in series with the main leads for the installation. Five models of the chokes are available, from 5 to 100 A. The smallest which has an inductance of 950 μH, a resistance of 0.026 ohms, and measures 5¾ by 1¼ in. for the two-pole type, is listed at 22s. 6d. The largest model has an inductance of 400 μH, a resistance of 0.00635 ohms, and measures 9¾ by 3 in.; it is listed at £8 10s.

Heterodyne Oscillator

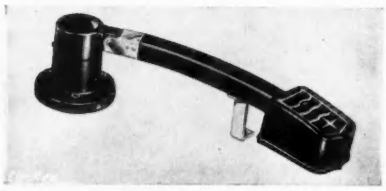
The Ryall-Sullivan precision heterodyne oscillator (0-12,000 cycles per sec.) is a stable form of rack-mounted beat-tone oscillator which has been developed by MESSRS. H. W. SULLIVAN, LTD., Leo Street, Peckham, S.E.15, in conjunction with Dr. L. E. Ryall, of the Post Office Research Laboratories. Its frequency stability and output characteristics are said to be above any oscillator produced in any country, and it is being adopted by the British Post Office for use in the main telephone repeater stations for checking the acoustical quality of important trunk lines. High stability of beat frequency is obtained by the use of radio-frequency oscillators of the dynatron type in which the tuned circuits are constructed from Sullivan-Griffiths thermal compensated inductances and air-mica condensers of high quality. Other claims are: A logarithmic scale of frequency

A precision heterodyne oscillator

of 0.2 per cent. accuracy; an hourly stability of 0.3 cycle per sec. and a daily stability of 1 cycle per sec.; a frequency that settles down immediately from switching on, which is not affected by valve replacement, power supply variation or load variation; a harmonic content of less than 0.3 per cent. for output powers of the order of 50 milliwatts and pure output up to 2 W; an output voltage throughout the entire range constant to 0.1 decibel. An earth-balanced non-reactive output impedance of 600 ohms is obtained for telephone repeater station work.

An Improved Gramophone Pick-up

An improved gramophone pick-up has been introduced by PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2. It replaces type 2980 and is known as type 2982. It is of a much heavier construction and this, combined with a very lightly damped movement, results in a faithful response to the lower frequencies. It is also claimed that there is an entire lack of undesirable resonance. The response is well maintained, within small limits, throughout the musical scale up to 5,500 cycles. Above 5,500 cycles the response is deliberately arranged to cut off to avoid needle scratch without sacrifice of brilliance. A freely mounted armature reduces record wear to a minimum. It has an output of nearly 0.75 V, which is more than sufficient to load up most radio receivers and reproducers with which it is likely to be used.



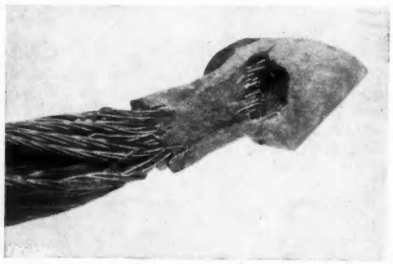
The new Philips "2928" pick-up

The pick-up incorporates the usual needle changing feature —the magnetic chuck—which imparts a floating action to the needle. The pick-up is constructed of ebony "Philite," and the volume control is mounted in the pillar. Connection is made to terminals contained in the base of the pillar, and an indicating line is incorporated on the pick-up head to facilitate lowering it on to the record.

The specification is as follows: Between 25 and 5,500 cycles, the output is maintained constant within 7 decibels. The output voltage at 1,000 cycles is 0.7 V r.m.s.; impedance at 1,000 cycles, 20,000 ohms; d.c. resistance 4,000 ohms; and the price with pick-up rest and nickel-plated screws is 32s. 6d.

Rail Bonds for Electric Traction

BRITISH INSULATED CABLES, LTD., Prescot, has recently developed an improved rail bond for electric traction. The body of the bond consists of a copper strand, and each end-piece of a steel head comprising a socket, into which the strand fits, and a flange webbed to the web of the rail. The improvement is embodied in the method of making the joint between the stranded wire or cable and the socket terminal piece.



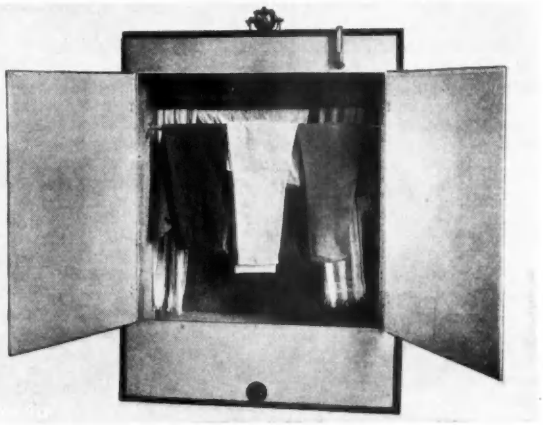
Section of the head of an electrically welded bond

In this method the stranded wire and the socket in which it is closely fitted are heated to welding temperature by the passage of an electric current through them. When the requisite temperature is reached the socket is compressed so as to consolidate the strand by forcing the wires to unite. At the same time the compression and temperature result in the strand becoming welded to the inner wall of the socket, so that the socket and strand form together a solid mass in the region where the compression has taken place.

The socket can be made of such a depth that the strand will extend into it beyond the point at which the compression and weld are affected, so that after the welded joint is made there is within the end of the socket a portion of the strand of the original diameter. The joint has high electrical conductivity and mechanical strength and is not affected by subjection to a high temperature, provided that this is not above the point at which either of the metals softens.

A Clothes-drying Cabinet

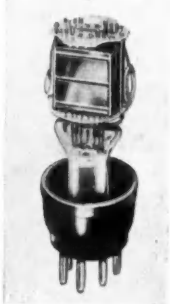
MESSRS. PRATCHITT BROS., LTD., Denton Iron Works, Carlisle, in conjunction with MESSRS. L. A. MITCHELL, LTD., 37, Fleet Street, Manchester, have put on the market a clothes dryer in which electrically heated air is circulated by a fan driven by a universal motor so that it can be used without modification on either a.c. or d.c. circuits. The "Dryeasy" is a portable, self-contained unit, requiring a floor space 4 ft. 6 in. wide by 2 ft. deep by 6 ft. high. Three-heat control of the elements is included, and the consumption is from 3 to 5 kWh per hour. The time taken for drying is from half to one hour. It is claimed that the circulation of air excludes the possibility of woollens shrinking or hardening. The retail price is about £30, varying according to the equipment which the purchaser requires.



The "Dryeasy" cabinet

A New Output Valve

One of the main difficulties with quiescent push-pull was the necessity for careful adjustment of screen voltages, it being held that by this means the anode currents could be matched and the best output obtained. Secondly, the use of two separate valves rendered it almost impossible to ensure stability of matching, owing to the different characteristic drifts. The MARCONIPHONE COMPANY, LTD., 210, Tottenham Court Road, W.7, has developed a new valve known as the "Q.P.21," which is designed to overcome these difficulties, as it has only one screen connection and any drift applies equally to both halves of the valve. The "Q.P.21" is based on the idea of constant slope push-pull, to ensure better quality of reproduction, especially on low loads. The two halves of the "Q.P.21" are adjusted to operate on a common screen voltage, and at a bias such that the total normal anode current is 2.5 to 3 mA. The current in each half need not be the same, so long as it does not fall below about 0.75 mA in either. These conditions being observed, "Q.P.21" can be used at any loading from a few milliwatts up to 1.5 W.



The new Marconi "Q.P.21" valve

The construction is robust, a dome top bulb being fitted in order to provide adequate support for the electrodes, and mica spacers are used at top and bottom. Other characteristics of the valve are as follows: Maximum output, at 120 V, 0.8 W, at 170 V, 1.5 W. Filament voltage, 2 V and current 0.4 A; max. screen voltage, 150; slope, 2.3 mA/V.

Oval Tubular Heaters

A new type of end cap has been introduced on the "Maxheat" oval tubular electric heaters made by the WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester. It is easily detachable, and when removed affords a ready access to the terminals. Multiple connectors are also now available for the oval heaters, and the accompanying illustration shows a four-way model. These new connectors are priced at 5s. (two-way), 7s. (three-way), and 8s. (four-way).

The four-way multiple connector, and connector removed, showing the terminals

Tubes fitted with multiple connectors are assembled and wired internally before despatch. Two outlet positions, one of which is closed with a removable cap, provide for cable entry at the left-hand or right-hand end as desired.

A Fair Trading Policy

An attempt to regulate electrical business relations

AMONG the provisions of the Electricity (Supply) Act of 1926 was one which aimed at solving the knotty problems involved in the relationship between the various sections of the electrical industry and trade users. The celebrated Clause 48 provided for the setting up of a "Fair Trading Committee," with the object of hammering out a policy. After several abortive attempts to secure unanimity this Committee (Committee "D") produced a final draft agreement and its work came to an end last July.

It is now understood that many difficult trading problems have been solved and misunderstandings due to lack of co-operation have been removed. A committee has reached agreement regarding principles, and recommends a new policy not only to all associated members but to the whole industry.

Who Has Approved the Policy?

Electrical manufacturers (including certain members of B.E.A.M.A., and makers of lamps, cables, accumulators and lighting fittings), contractors, and wholesalers who are members of the recognised association representing the interests of their section of the industry, have adopted for a trial period of one year from a date yet to be fixed what is described as a Fair Trading Policy for the Home Trade.

The Councils of the following associations have agreed to the basic general principles of the fair trading policy as applicable to the main body of items mentioned below:—The B.E.A.M.A.; the Cable-makers' Association; the E.C.A.; the E.C.A. of Scotland; the Electric Lamp Manufacturers' Association; the Electric Light Fittings Association; the Accumulator Makers' Association; and the Electrical Wholesalers' Federation.

A Council representative of these various organisations has been formed to put the policy into operation for the trial period until permanent machinery is set up. The duties of this Council include the settlement of certain discount schedules (of which details will be available later); the receipt and handling of complaints arising out of the operation of the policy; reviewing the operation of that policy during the trial period; the investigation of possible necessary alterations in operating machinery in the light of experimental experience, making recommendations for the setting up and financing of permanent machinery; and finally, making arrangements for the preparation of a Register of Recognised Users.

The Why and Wherefore

The Council has been formed because it is felt that the time has arrived when the various electrical industrial interests in Great Britain and Northern Ireland should be fully and effectively organised and when fair trading principles should be observed between all engaged in manufacturing, buying and selling electrical fittings, apparatus and appliances. It is felt that trading policy has not kept pace with the progress of the industry.

In order to make the grid a success the manufacture and distribution of electrical commodities should be so organised that users shall be able to obtain supplies at reasonable prices and that distributors shall be adequately remunerated for their services. Producers should be able to make reasonable profit for shareholders, to pay reasonable wages (avoiding labour disputes), and to provide for research, standardisation and development. It is believed that these conditions can be secured by the wholehearted co-operation of all sections of the industry on fair trading principles.

The Policy

The general principles fundamental to fair trading are described thus:—

(*a*) That, so far as is reasonably practicable, the suppliers should sell only to electrical contractors, retailers and supply authorities.

(*b*) That electrical contractors, retailers and supply authorities should purchase preferably from suppliers who support this Fair Trading Policy, and wholesalers should purchase preferably the products of manufacturers who also support the policy.

(*c*) That electrical contractors, retailers and supply authorities should maintain the manufacturers' list prices when reselling to the user.

(*d*) That discounts allowed from manufacturers' list prices should not be regarded as perquisites or gratuities but as payments for services rendered in selling or influencing the sales of the manufacturers' products.

(*e*) That services rendered in selling or influencing sales should be adequately remunerated.

The general principles are amplified as follows:—(*f*) Notwithstanding the principle set out in (*a*) suppliers may, where they might otherwise lose the order, sell to any buyer, but, unless included in Schedule 2 the recognised list prices shall be charged, the appropriate discount being reserved to such contractor or retailer as may prove himself entitled thereto by having rendered suitable service in the particular transaction. (The discounts appropriate to each class of buyer are given in Schedule 2, which is not adopted yet.) (*g*) In no case, however, is a supplier liable to pay more than the full trade discount in the event of more than one contractor, retailer, or supply authority being entitled to some portion of such discount.

(*h*) Electrical contractors, retailers, or supply authorities should charge not less than full list prices, except to any buyer included in Schedule 2 to whom the appropriate discount given in that schedule may be allowed.

(*j*) Electrical contractors, retailers or supply authorities should, when selling to recognised users, allow only such discount as is provided in Schedule 2 for recognised users.

Definitions

It has been thought essential to define a number of terms used in the policy. The principal definitions are as follows:—Electrical fittings, for the purpose of the policy, means those electrical products (such as wiring accessories, lighting fittings and domestic appliances) which at present are dealt with by electrical wholesalers, electricity supply authorities, contractors and retailers. The term "electrical wholesaler" means any person, persons, company or firm whose main business is wholesale distributing; who carries adequate stocks of electrical fittings for supply to electrical contractors, retailers or recognised users; who does not make direct sales to the public without the recognised trade reservation; and does not carry out electrical installation work.

"Supplier" means any electrical manufacturer or wholesaler as defined or any person or company otherwise engaged in selling to the trade. An "electrical contractor" is a person or company (or department) with suitable premises and equipment, principally engaged in the business of selling and installing electrical fittings. An electrical retailer is any person, etc., with shop or showroom premises and equipment suitable for a retail trade, or equivalent facilities for resale, who carries a reasonable stock of electrical fittings and sells to the user.

Recognised users will be such persons or companies as are included in the Electrical Register which it is intended to prepare and operate. Any person or company who gives permanent employment to one or more journeymen electricians, wholly on the installation and/or maintenance of electrical fittings, will be eligible for inclusion in the Register. Pending the preparation of the Register all persons and companies complying with the last proviso will be recognised, but this shall operate only for a stipulated period.

Existing trade agreements between recognised associations are not affected, it being understood that the principles of the Fair Trading Policy will be embodied therein.

The Personnel

The following are the present representatives on the Fair Trading Council (those for the C.M.A. and the Accumulator Makers' Association have not yet been announced):—

Chairman: Mr. D. N. Dunlop. B.E.A.M.A.: Messrs. H. A. Aston, T. W. Heather and V. Watlington; E.C.A.: Messrs. T. E. Alger, L. C. Penwill and W. H. Walton; E.W.F.: Messrs. A. Albrecht, A. G. Beaver and G. Donovan; E.C.A. of Scotland: Messrs. J. Allan and W. Finlay; Elec. Lt. Fittings Ass.: Messrs. W. T. Dean, C. Harvey and A. E. Iliffe; E.L.M.A.: Mr. C. W. Sully.

The Council met for the first time on October 30th, 1933. Mr. D. N. Dunlop, O.B.E., was elected independent chairman of the Council for the time being. The necessary arrangements for carrying into effect the Council's decisions are being actively carried out. The date when the policy will be put into general operation will be fixed by the Council as soon as an adequate number of manufacturers, wholesalers and contractors have signed an undertaking to work in accordance with the principles of the policy. Already over 2,000 acceptances have been received, and we are informed that the response from those manufacturers, wholesalers and contractors who are not members of the constituent associations has been gratifying.

The Fair Trading Council has circulated very widely an agreed document regarding the matter and it invites all firms in the industry who have not yet received copies to communicate with the permanent secretary, Mr. Felix A. Rogers, at the offices, Kern House, Kingsway, London, W.C.2, from whom full information can be obtained.

Poor Speech at Technical Meetings. By "Auribus"

MOST, if not all, of the institutions are free from general criticism, but in one respect serious ground exists for genuine complaint. Much too little attention is paid by the powers that be to the standards of the *delivery* of papers, and of the subsequent discussions.

To those who are accustomed, even in quite a humble way, to public speaking, and at the same time are regular listeners at technical meetings, this shortcoming appears to be little short of deplorable. The trouble is not confined to any one institution, or section; all suffer alike, if in varying degree. From this one is forced to the disappointing conclusion, that among technical men as a whole the faculty of public address is pretty well left to its own resources. Bearing in mind the high technical merit of the subject-matter generally, one finds oneself leaving the usual meeting with a feeling of irritated disappointment, realising that what otherwise would have been a delightful evening has been hopelessly spoiled.

The spoliation, moreover, is twofold: for in addition it hits at one's pride of calling (still a motive force, despite slump and cynic). Poor delivery of a paper, and/or of the reply to it, conveys to the earnest listener the feeling that a lack of common education exists, countered though this may be, to some extent, by the quality of the contents of the paper. Consequently, one wonders whether a technical training must invariably preclude any other kind of training. This leads in turn, and with something of a jolt, to the realisation that one's own examination papers ignored entirely the verbal side of the matter. More strange still, the next thought is, that each institution exists largely for that very verbal dissemination, the ineffective execution of which is the cause of the trouble.

Speaking or Reading?

Few papers are read in full: the I.E.E. at least definitely discourages this practice. A résumé by the speaker, lasting not more than thirty to forty minutes, is preferred. To memorise this is the simplest thing in the world. The few necessary and simple rules of mental connection can be found in any low-priced volume on public speaking, and their application is far easier than the construction of the résumé itself. It is astonishing that such simple, but vital, adjuncts to technical delivery seem to be so entirely neglected.

The ideal is to make all remarks as nearly extempore as possible; this can only be done by making adequate use of the natural functioning of any ordinary mind. Which is to be preferred—a free, unfettered face, constantly and actively on the audience, or a dreary monotone reading, eyes glued to the stand, voice reflected to the chairman's back, and a demeanour generally suggesting a prayer to Heaven that it will soon be all over?

Remarks which are read possess one vital defect: they *kill* the interest of the audience. Only the most expert elocutionist can prevent this, and even he has a hard task. Compare the attitude of an accomplished after-lunch speaker, even though the style of meeting be different. He conveys no idea of studied preparation. He keeps his figure constantly alive. His eyes rest on every member present in short turn, sufficiently adequate, but no more than just adequate, to convey to every hearer that feeling of gentle deference toward him, so necessary to his assimilation of the main content of the spoken word. He who reads his remarks simply cannot do this.

In these times this idea of deference towards assimilation is peculiarly important. Few men attending an institution meeting can find time to study in detail matters outside their general duties, as in their days of graduateship and lighter responsibilities. To them the meetings are most welcome events, for they provide the opportunity needed "to keep them in touch."

All the more intense is the disappointment when it does occur; and rarely do technical speakers realise that this feature as a whole endows them to start off with one supreme advantage. The audience is willing to listen to them before they commence. Verbal trickery as a means of forcing artificial interest is rendered quite unnecessary, and one of the ordinary speaker's major worries does not clog the technical man from the outset.

Apathy and Enthusiasm

A recent lantern address in Birmingham exemplified the point particularly. More than merely modern, the subject visualised a particular technical future. As a result the speaker had a gratifyingly large audience, which animated its preliminary tea-taking by keen anticipation of the nature of the expected remarks. After twenty minutes, some left the room; by the end of the address the audience had dwindled by half. Read in its entirety, the paper, worse still, had been constructed quite without regard to the interruptions which would essentially occur as the speaker periodically left the dais to point to the screen. To cap all, each time the speaker did move to the screen, he spoke straight into it, to the direct exclusion of his audience! The resulting discussion, carried on by the few who retained any interest at all, showed most obviously that even they had missed half of the essential points which the lecturer had indicated particular desire to stress.

Few things are more disastrous than the omission to look an audience, and particularly a questioner, in the face. Yet this might be singled out as the fault most common to all technical meetings. Dropping eyes almost invariably prelude shifting feet and closing lips: all conveying the irritating suggestion of uncertainty, unconcentrated thinking, and sense of requiring to answer because one must, not because one loves to. Against this, the confident speaker will positively poise on his toes when replying, through sheer enthusiasm for his subject. Most technical men, deep down, possess the same enthusiasm, but the expression of it consciously or unconsciously is lacking.

No one doubts for a moment that the consciousness of his responsibility toward his particular audience, weighs heavily upon a technical speaker, and this is indeed evidenced by the very careful preparation of subject matter, which is generally the case.

It is surely the duty of the responsible governing bodies to insist that defective delivery of papers shall be rectified. On the selling side, E.D.A. has already found the same problem, and has been courageous enough to initiate public speaking contests, with a view to finding a cure. Irrespective of whether this is the correct method or otherwise, there is no doubt that, in total, there exists as much, if not more, potential talent on the purely technical side of the business. Why, therefore, do not the purely technical institutions pay due regard to the same thing?

New Hire Scheme for Southend

EVER eager to explore new fields for developing its load, Southend-on-Sea Electricity Department is now proposing to introduce schemes of simple hiring for apparatus.

The domestic load, says Mr. A. C. Johnson (borough electrical engineer and manager) in a report detailing the proposals, is the only load in a town like Southend which offers any scope for rapid development, and he anticipates that within two years over two thousand cookers and a similar number of water heaters, as well as many other appliances, would be hired.

A hire-purchase scheme has been in successful operation in the town since July, 1931, when the change-over from d.c. to a.c. was in its initial stages, but it is felt that hire-purchase has definite limits in face of the easy hiring terms available for gas appliances. Data published by the British Electrical Development Association show that 179 (79 per cent.) out of 227 electricity undertakings, replying to a questionnaire, are hiring out appliances, and in practically every case largely increased sales have resulted.

Two separate schemes are proposed—simple hire and "free" hire. The type of apparatus coming under the simple hire scheme will comprise water heaters, cookers, wash-boilers, off-peak heating installations, boilers, refrigerators, and dryers. The cost of the wiring is not included, but may be paid off under an assisted-wiring scheme if desired. The object of this scheme is to encourage the use of heavy-current consuming apparatus, which is largely off-peak throughout the year, and it is not therefore proposed to include either radiators or small domestic apparatus.

Under the "free" hire scheme the charge for the hire of apparatus is added to the price of electricity. The Corporation will install free of charge specified groups of appliances with wiring and the consumer will pay a small increased kWh charge. It is suggested that two standard installations should be adopted, *viz.*, (*a*) cooker, wash-boiler and radiator, on which the first 480 kWh a quarter (560 kWh for prepayment meters) will be charged at 1d. per kWh (including ½d. to cover hire); and (*b*) water heater (immersion or self-contained), on which the first 360 kWh a quarter (440 kWh for prepayment meters) will be charged at ½d. per kWh (including ½d. to cover hire). If the hirer accepts both installations the water heater is to be supplied at ½d. per kWh. The minimum quarterly payment is to be 10s. for installation (*a*) and 3s. for (*b*).

Both hiring agreements are to be for a minimum period

of three years, the hirer to have the option, at any time after three years, of purchasing the apparatus and wiring on hire or payment of the outstanding debt.

Mr. Johnson informs us that eighty per cent. of the total area of the borough has now been converted to a.c., and during the past four years 95 miles of l.p. mains and 13 miles of h.p. mains have been laid and forty transformer stations have been put into commission. During the same period the capital expenditure on mains, services and transformer plant has reached a total of £300,000.

Contractors and the New Policy

Speeches at the E.C.A. annual dinner

ASSUMING that the atmosphere at the annual dinner of the Electrical Contractors' Association held in London on Tuesday last is representative of feeling in all sections of the industry, there is now readiness on all sides for genuine co-operation in trading matters, and, what is more, a desire to see "the other man's point of view." Sir John Brooke, C.B., vice-chairman, Electricity Commission, seemed anxious to impress on the contractors that the supply section regarded them as important canvassers. He knew from personal observation that the supply undertakings were keen to work in close co-operation with the Association.

Mr. Joseph Orringe, the president, who was in the chair, said that he had recently been greatly encouraged by visits to important centres in the country. Progressive supply undertakings were making really impressive headway because they adhered to a commercial policy based on three main considerations. They had instituted two-part tariffs with very low running charges; they had devoted themselves whole-heartedly to mains extensions; and they had adopted the sound business policy of working with their local contractors.

He welcomed the new Electricity Supply Regulations made by the Commissioners because they gave the electrical contractor, as the consumer's "authorised agent," a definite standing; they also gave the industry some control over the questionable domestic apparatus that had recently appeared on the British market.

The E.C.A. had given entire support to the recent reorganisation of the Electrical Development Association, and welcomed the appointment of Sir William Ray.

Fair Trading

Referring to the long and painstaking work of "Committee D," and to the Fair Trading Council, he said that solutions *must* be found for the trading abuses that existed, including the modern disease of "discount snatching," whereby even the employés of banks, insurance offices, and certain industrial institutions sought to impoverish their principal customers.

The invasion by supply authorities of the wholesale field was a matter that very gravely concerned the entire industry. Normal trading was based on a clear demarcation between the wholesaler and the retailer, and if that demarcation were abandoned then our whole commercial system would be thrown into the melting-pot. Supply authorities were very ill-advised if they failed to recognise that the greater bulk of their own consumers were directly dependent upon trade. Because electrical contractors did not wish to prosper at the expense of others, they supported the principles of the maintained price, the trade agreement, and the square deal.

The Association devoted itself very seriously indeed to the cause of thorough apprentice training both on the theoretical and practical sides. Half-trained men were the source of endless trouble and loss to the entire electrical community. It was the constant anxiety of the E.C.A. to do everything within its power to ensure that future installation workers should be thoroughly trained in their craft.

Mr. W. H. Walton emphasised his constant anxiety for closer and more stable trading agreements with such associations as B.E.A.M.A., C.M.A., E.L.M.A., and the A.M.A. After many years of strenuous apprenticeship to the science and art of trade negotiation, he had been elected to represent the Association on the Fair Trading Council, and he very seriously commended the work of that body to the understanding and active support of the entire industry.

Personalities at the E.C.A. Dinner
Left to right: The President and Mrs. Orringe; Sir Philip Dawson, M.P.; the President greeting Sir John Brooke; Mr. W. B. Woodhouse

In a long speech, Sir Philip Dawson, M.P., said that he could take a broad view of the E.C.A., because he was, or had been, a consulting engineer and directly connected with the contracting, manufacturing and supply sides of the industry. In calling for legislation to correct the drawbacks to future progress, he asked how the industry could get on when faced with twelve different frequencies, forty-six different voltages and wide variations in supply tariffs in adjacent neighbourhoods or even houses. It was not right for a large power undertaking to find itself serving only the "thin" districts of an area in which the populated parts were in the hands of the local authorities.

The bright spot of the evening, we thought, was when Mr. W. B. Woodhouse, Yorkshire Electric Power Co., called for the thorough wiring of houses throughout for all services, rather than the piecemeal wiring which was the vogue. In that work the E.C.A. would have the full support of the supply section and all who used electricity. In outlying districts the contractor was particularly important, for it was essential for the case for electricity to be put forward by local people.

In the next seven years he believed another five million consumers would be connected to the supply mains, and that represented a rosy picture for contractors. But he appreciated their difficulties, including unfair competition. Supply undertakings also had difficulties, however, which were not generally realised. For instance, regarding the hiring-out of apparatus, the electricity undertaking often had to compete with gas undertakings which let out equipment at very low rates and sometimes for nothing. In reducing hiring rates the supply undertakings had helped the contractors as well as the consumer. Regarding hire-purchase, cheap finance was wanted, and the supply undertakings were in a position to obtain this and so help to attract new business.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

E.D.A. Poster Design Competition

The British Electrical Development Association has issued particulars of the Poster Competition which it has organised with the object of increasing the demand for electricity or electrical appliances. The competition is confined to persons engaged in the electrical industry and competitors are not permitted to submit more than three designs or ideas. All designs or ideas should be suitable for reproduction in either crown size (30 in. by 20 in.), and/or 16-sheet size posters (120 in. by 80 in.), and must be sent to the Association at 2, Savoy Hill, W.C.2, by April 28th next. Prizes of £10 10s., £6 6s., and £4 4s. are offered. Full particulars and conditions can be obtained on application to the Association.

A New Reyrolle Development

Messrs. A. Reyrolle & Co., Ltd., have acquired an interest in the Parolle Electrical Plant Co., Ltd., which has been formed with the object of undertaking the construction of electrical power and other works and the acquisition of interests in manufacturing and other undertakings in any part of the world. The registration of this company is recorded in the "New Companies Registered" section of this issue. The Parolle Co. has purchased from the executors of the late Sir Charles A. Parsons shares held by him in Messrs. C. A. Parsons & Co., Ltd. The authorised share capital of the Parolle Electrical Plant Co. is £500,000, of which £260,000 has been issued in ordinary shares subscribed for by A. Reyrolle & Co. The Parolle Co. is a private company, and its directors are Mr. Norbert Merz and Mr. H. W. Clothier, directors of Reyrolle's, and Mr. F. G. H. Bedford, managing director of C. A. Parsons & Co., Ltd.

"Sunco" Improvements

The Sun Electrical Co., Ltd., has recently completed extensive alterations to the front of its premises in Charing Cross Road, and the accompanying illustrations give a general view of the front and the entrance lobby. This is the first major alteration that has been made to the front of the premises since the foundation of the company in 1899, although considerable extensions have been made from time to time at the back of the premises.

The reconstructed frontage of the Sun Electrical Co.'s premises, Charing Cross Road

Wages in the Cable Making Industry

The Joint Industrial Council for the Electrical Cable Making Industry informs us that there will be no "cost-of-living" alteration in wages on the third pay-day in February.

Australian Tariff Duties

The *Board of Trade Journal* states that the Australian Tariff Board proposes to commence at the end of April a series of inquiries on various subjects, including the import duties on electric current rectifiers and electric lamps; the imposition of a dumping duty on Japanese electric lamps is also to be considered. It has been decided to impose a 45 per cent. *ad valorem* British preferential tariff on electric switches used on refrigerator automatic control thermostats. On machinery in which the shaft of a generator and motor is common to both the British preferential tariff is as follows: When machinery comprises a d.c. motor and d.c. generator, free or 45 per cent.; when comprising an a.c. motor and a d.c. generator and exciter, 45 per cent.

Employment during 1933

Taken as a whole employment in the engineering industry improved steadily throughout 1933. Statistics published in the *Ministry of Labour Gazette* show that the unemployment percentage decreased from 27.6 in January and February to 17.8 in December, while the average for the year was 23.1 as compared with 27.2 in 1932. The improvement was experienced in most sections of the industry, and in all divisions of the country. At December 18th, those out of work numbered 170,612 (17.8 per cent.), as against 160,820 (17.9 per cent.) a month before. In electrical engineering employment was fair at the end of the year, the number unemployed in December being 9,577 or 10.6 per cent., which compares with 11.6 per cent. in the preceding month and 16.4 in December, 1932. The number out of work in the electric cable, apparatus and lamp trades, &c. (11,940) amounted to 9.5 per cent., which is 0.4 per cent. higher than the November figure, but 2.8 per cent. below that for December, 1932. The electrical wiring and contracting industry with 3,862 (14.0 per cent.) unemployed showed decreases of 0.8 and 1.1 per cent. as compared with November, 1933, and December, 1932, respectively.

Wages in the Electricity Supply Industry

The National Joint Council for the Electricity Supply Industry met at the Ministry of Labour on January 19th. According to the *Times*, Mr. J. Rowan, general secretary of the Electrical Trades Union, afterwards stated that there was no general application for an advance in wages before the Council, but in six or seven areas claims had been made for either wage increases or a restoration of the cut of ½d. an hour imposed in February, 1932. Those claims would first be considered in the areas concerned. They might eventually come to the National Council, and in that event there might be a co-ordinated programme from all the areas.

Electric Ship Propulsion

Commander C. W. Craven, O.B.E. (Vickers, Ltd.), was the principal guest at the monthly luncheon of the Batti-Wallahs' Society on January 18th. Mr. W. Lang, the president, was in the chair. After some humorous reminiscences, Commander Craven touched upon the position of the electrical engineer in shipbuilding. He said that during the last year or two his company had installed turbo-electric propulsion in five large ships. He maintained, however, that the system of propulsion was entirely the business of the shipowners, although the builders might put forward suggestions. He was bound to say that no faults had developed in any of the electrically propelled vessels to which he had referred. But apart from propulsion the electrical engineer had a growing interest in all new first-class ships. The "heavy" trades were undoubtedly showing signs of improvement; recent shipbuilding orders had been most encouraging, although it had to be remembered that the improvement started from a very low datum line. A vote of thanks to the speaker was accorded on the motion of Mr. W. McClelland, C.B., O.B.E.

Recent Contracts

Among the orders recently received by the British Thomson-Houston Co., Ltd., for electric trolley-bus equipments is one from Karrier Motors, Ltd., for a complete equipment for Portsmouth. The Sunbeam Motor Car Co. has also ordered twelve complete equipments for Bournemouth and four for Portsmouth. The last-mentioned order is in addition to a sample equipment at present in service at Bournemouth.

The English Electric Co., Ltd., has received an order from the Leather Cloth Co., Ltd., London, for a turbo-alterator set comprising a 1,000-kW geared impulse pass-out turbine running at 6,000 r.p.m. and having a maximum continuous rating of 1,000 kW. The set will generate power and supply process steam for the works up to 15,000 lb. of steam per hour at a pressure of 30 lb. per sq. in. gauge. The alternator will

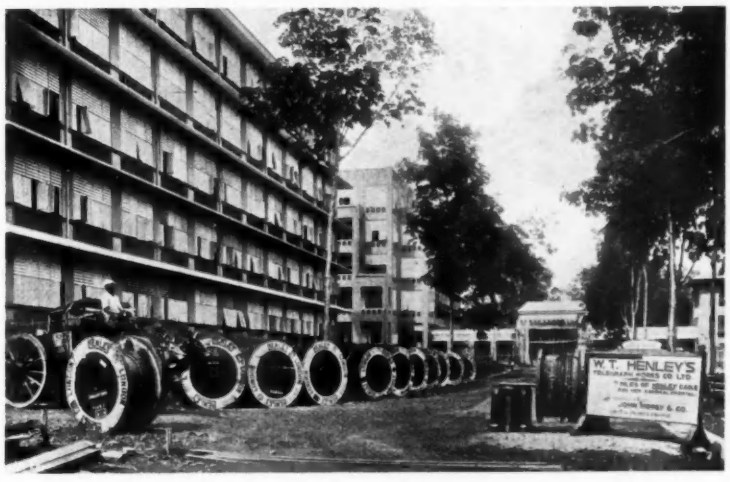
generate power at 500 V 50-cycles, three-phase. The order also includes the necessary switchgear.

In connection with the Southern Railway's scheme for the extension of the electrification of the main line system to Eastbourne, a large contract for conductor rail insulators and clips has been placed with Messrs. Taylor, Tunnicliff & Co., Ltd.

The Swedish Royal Telegraph Administration has placed an order with Marconi's Wireless Telegraph Co., Ltd., for the equipment of a broadcasting station of the "super-power" class to replace the existing long-wave station at Motala. The equipment will be designed and constructed entirely at the company's Chelmsford works.

Henley Cables in a Malayan Hospital

During the progress of the contracts for the new General Hospital, Malacca, Messrs. John Morey & Co., of Singapore, employed a total staff of 285 men. The contracts were for the installation of power cables and for the wiring of the hospital. The power cables installed were three-core, paper-insulated, lead-covered and steel tape armoured for a working pressure of 6,600 V, and four-core and twin for a working pressure of 660 V, and all were of Henley manufacture. The wiring of the hospital was partly with "Superite" and partly with cable taken from Public Works Department stocks. In addition, Henley's supplied the necessary distribution pillars and "Isco" cut-outs.



Henley cables at the General Hospital, Malacca

Engineering Scholarships for Chinese Students

The first seven Chinese engineering students to be awarded scholarships by the Federation of British Industries have arrived in this country. The scholarships are awarded under a grant made from remitted Boxer Indemnity Funds by the Universities China Committee in London, and their object is to develop trade and cultural relations between China and the United Kingdom. The *Times* reports that on the completion of their training the students will be helped to secure responsible engineering positions in China. The companies which have accepted these students are: The Metropolitan-Vickers Electrical Co., Ltd.; Belliss & Morcom, Ltd.; Sir W. G. Armstrong, Whitworth & Co., Ltd.; George Kent, Ltd.; Vickers-Armstrong, Ltd.; and Craven Bros. (Manchester), Ltd.

Floodlighting by Gaseous Discharge Lamps

The accompanying illustration shows the Worcestershire Brine Baths Hotel, Droitwich, which were floodlighted by means of G.E.C. "Osira" floodlights in connection with the S.W.S. Power Co.'s Area Circle dinner held on January 18th. Ten of these units were used for floodlighting the building in red, five being placed on each side of the entrance. The centre block of the building above the canopy was illuminated in green by means of three projectors, while underneath the canopy the entrance was floodlighted in blue by one unit. The scheme attracted so much attention that it was kept in commission for the remainder of the week.

"Osira" floodlighting at a Droitwich hotel

Advertising Electricity

On Monday last Sir Wm. Ray, Executive Chairman of E.D.A., addressed the London Publicity Club on "Advertising Electricity."

New Zealand Electrical Imports

During the September quarter of 1933 the value of telephone and radio apparatus imported into New Zealand totalled £65,549, of which the United States was responsible for £38,326, Australia for £12,882, and the United Kingdom for £11,363. Other electrical apparatus imports were valued at £126,939, the principal suppliers being the United Kingdom (£94,443), Australia (£9,552), Canada (£9,064), and the United States (£6,607).

American Lamp Trade

The *Electrical World* states that preliminary estimates of the number of incandescent lamps sold in the United States in 1933 indicate 616,000,000 large and small units to have been merchandised. This figure is 11 per cent. above the sales in 1932, and is within 3 per cent. of the sales in 1929, the only other year in which a 600,000,000 unit total has been exceeded.

Works Visit

A delegation from Latvia is visiting this country, and the Department of Overseas Trade has arranged visits for the delegation, which includes representatives of the Latvian Ministry of Finance, Messrs. A. Kacens and A. Zalts, and His Excellency Mr. K. Zarine, the Latvian Minister in London, to industrial centres in this country. They visited Manchester on January 19th, and were conducted over the works of Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park. They went through nearly all the departments, beginning with those where large turbo-generators and heavy electrical machinery of all kinds are manufactured and going on to the Meter Department. They also inspected the research laboratories of the company, and saw some of the kitchens and canteens. The company entertained them to lunch and invited Mr. R. Bond, president, and Mr. E. Sudlow, chairman of the European Section, of the Manchester Chamber of Commerce, and Messrs. H. A. MacKay and James Robinson, representing the textile machinery manufacturers. A photograph of the visitors at the company's works is reproduced on page 123.

Change of Name

Our contemporary the *Tramway and Railway World* has changed its name to the *Transport World*.

Electric Welders in Shipyards

The negotiations between the employers and trade unions of the shipbuilding industry with regard to the dispute over the employers' proposals to create a new skilled class of electric welders have apparently broken down. A conference between the Shipbuilding Employers' Federation and the trade unions concerned was held in Edinburgh on January 10th and was adjourned until January 19th. No further meeting between the parties having taken place since then, the conference has now been declared closed.

Welding Equipment in France

We learn from a French source that there are openings for British-made electrodes, and possibly electric welding apparatus, in a number of departments of France. A Lyons concern connected with the welding business is desirous of getting into touch with British makers of this class of equipment, and we shall be glad to forward any inquiries from interested readers.

For Sale

Mr. G. R. Lightfoot will sell by auction on February 8th at 13, High Holborn, W.C., the electrical stock of a wholesale warehouse.

(See our classified advertisements.)

Social Events

A dinner was given recently by the directors of Messrs. A. Rist (1927), Ltd., Lowestoft, to the staff in connection with the opening of a further extension to the company's works. Mr. Rist, the managing director, said that it was hoped, by starting a new business in the drawing and manufacture of copper wire, cotton-and-silk-covered wire, and enamelled wire,

that Lowestoft would become prominent as a supplier. They had been promised orders which would keep the factory going for a considerable time.

The staff of Premier Electric Heaters, Ltd., held a dinner-dance at the Imperial Hotel, Birmingham, on January 19th. Mr. H. F. Collins, supported by Mr. G. H. Collins, presided over a gathering numbering over one hundred of the staff and friends. Those present included Miss A. M. Collins and Mrs. H. Collins and most of the executive and outside sales staff. Mr. S. L. Whitehouse, the firm's architect, responded to the toast of the visitors, proposed by Mr. G. H. Collins.

An Italian Agricultural Electrification Competition

The Italian National Committee for Agricultural Electrification is to hold a competition for the improvement of systems of mechanical labour on farms by the use of electrical energy. Two prizes of 70,000 lire, two of 30,000 lire, and gold medals will be awarded. The competition closes on March 15th.

A cooking demonstration in progress at Stafford

The Brussels Exhibition

The electrical section of the exhibition which is to be held in Brussels during 1935 will be divided into a number of groups comprising power production, transmission, tele-communication, lighting, electro-chemistry, laboratory research work, thermo-electricity and electrical engineering, in respect of each of which special committees consisting of men well known in their respective spheres throughout Belgium have recently been formed.

Prices of Materials

Messrs. F. Smith & Co. report, January 24th: Copper (electrolytic) bars £37, £1 10s. increase. Copper (electrolytic) wire rods, £41, 10s. increase. Copper (electrolytic) h.c. wire, 7$\frac{5}{8}$d., $\frac{1}{4}$d. increase. Silicium bronze wire, 8$\frac{1}{4}$d., $\frac{1}{4}$d. decrease.

Messrs. Edward Till & Co. report, January 24th: India-rubber, Para fine, 4$\frac{1}{4}$d., $\frac{1}{4}$d. increase.

Messrs. James & Shakespeare report, January 24th: Copper bars (best selected), sheet and rod, no change. English pig lead, £13, 5s. increase.

Ilford Electrical Contractors' Dinner

The annual dinner and dance of the Ilford Electrical Contractors' Association will be held on February 22nd, at 7 p.m., at the Town Hall, Ilford, Mr. F. W. Rylands (Rylands Electrical Co., Ltd.), chairman, will preside.

The 40-hour Week

A joint conference between the unions of the engineering industry and the Engineering Employers' Federation is to be held in London on February 15th, at which the proposals of the unions that the working week should be reduced to forty hours as a means of increasing employment will be discussed.

Trade Announcements

Messrs. Burke & Co., Ltd., have extended their business by the acquisition of premises at 530A, Chester Road, Old Trafford, Manchester, where they have opened an up-to-date showroom in which they are exhibiting and demonstrating electrical appliances of all leading makes, including radio receivers, vacuum cleaners, &c.

Mr. N. Jones has severed his connection as director and manager of Messrs. Ridout & Ratcliff, Ltd., and has taken offices at 237, Baker Street, N.W.1, trading as Nathaniel Jones, Ltd. He asks for catalogues, &c.

Proposed Copper Code in the U.S.A.

A *Reuter* message from New York states that the American copper producers and the Customs Smelters have formed the United States Copper Association, an organisation to sponsor the proposed Code which is to be discussed in Washington. It is understood that the Code retains the provision for a minimum price. This price is yet to be determined, though it is believed to be 9 cents per lb. delivered.

B.T.-H. Sound Amplifying Equipment

At the Showmen's Annual Meeting held at the Caxton Hall, Westminster, S.W.1, on January 18th, the speeches were relayed to all parts of the room by means of a B.T.-H. 10-W sound amplifying equipment which utilised components similar to those incorporated in the equipment specially developed by the British Thomson-Houston Co. for the use of showmen, the amplifier operating two type "KR 8" loud speakers. The meeting was followed by a supper and dance at Olympia, and for relaying the after-supper speeches, the company's sound-amplifying equipment was again used.

Electric Cooking Demonstrations at Stafford

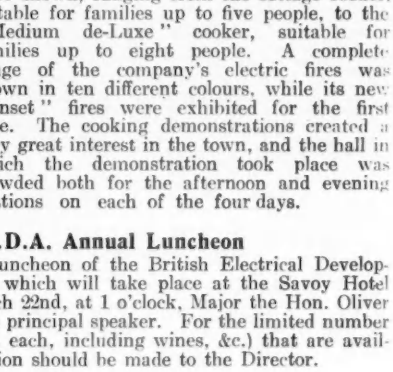
The English Electric Co., Ltd., in co-operation with the Stafford Corporation Electricity Supply Department, held electric cooking demonstrations at the Borough Hall, Stafford, from January 15th to 18th inclusive. The demonstration was officially opened by the Mayor (Councillor S. Robinson, J.P.) supported by the Mayoress. Councillor W. H. Westhead (chairman of the Electricity Committee), who presided, referred to the recent reductions in tariffs and to the sale of electric cookers and other labour-saving appliances on attractive terms. The Mayor said that the new tariffs would enable all classes to take advantage of the many facilities for the use of electricity. Mr. J. Bissett, general manager of works, also spoke. Six cookers were shown, ranging from the cottage cooker, suitable for families up to five people, to the "Medium de-Luxe" cooker, suitable for families up to eight people. A complete range of the company's electric fires was shown in ten different colours, while its new "Inset" fires were exhibited for the first time. The cooking demonstrations created a very great interest in the town, and the hall in which the demonstration took place was crowded both for the afternoon and evening cooking demonstrations on each of the four days.

E.D.A. Annual Luncheon

At the annual luncheon of the British Electrical Development Association, which will take place at the Savoy Hotel on Thursday, March 22nd, at 1 o'clock, Major the Hon. Oliver Stanley will be the principal speaker. For the limited number of tickets (12s. 6d. each, including wines, &c.) that are available early application should be made to the Director.

Brush Activities

Orders under execution by the Brush Electrical Engineering Co., Ltd., include one for a Ljungstrom turbo set for Fulham, and a smaller machine for Sheerness. The range of the new design of back-pressure turbine of 100 kW and upwards is being extended. Transformers built recently reflect the trend of opinion in favour of on-load tap-changing gear, either with automatic relay control or with remote push-button control. A notable order completed was that for two 2,500-kW motor convertors for Luton. New designs include those for flame-proof slipring motors, totally enclosed frame-cooled motors, high-torque motors, and trolley-bus motors for Bournemouth and Derby. A new alternator compounding equipment enables the degree of compounding to be altered on load. The company has turned its attention to new lines of products, such as the "Homogeniser" which is being supplied to dairies and similar places. The most noteworthy recent development has been the Brush-Diesel engine, described in the ELECTRICAL REVIEW of December 8th, which is being manufactured under the supervision of Mr. H. V. Senior.



A motor and gears supplied to South . Crofty by the Brush Co.

An Automobile Lamp Case

The General Electric Co., Ltd., is now marketing a handsome case covered in navy blue leatherette for holding automobile spare lamps, in lieu of the former metal type of case. The new case is designed to accommodate two headlamps, two sidelamps, one indicator and two festoon lamps, and is sold at 3s., without lamps.

A Winding-up Order

In the Companies Winding-up Court, Chancery Division, on Monday last, Mr. Justice Eve had before him a petition by Mr. H. J. B. Franks, carrying on business as H. B. Franks, of 4, Cullum Street, London, for the compulsory winding up of the Lunar Electrical Co., Ltd.

Counsel for the petitioning creditor said their debt was for £189 on a bill of exchange which was dishonoured, and also a small balance due on goods. He also appeared for a supporting creditor, the Albion Electric Lamp Co., for £4,000.

There was no appearance by the company, and his Lordship made the usual compulsory order and the usual order as to costs.

The stand of Messrs. W. J. Gallier at the Home Life Exhibition, Brighton

New Catalogues and Lists

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, N.1.—Catalogue dealing with "Super Straight-Lite" reflectors for the "Maxtrip" "2" system.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—Two well-illustrated brochures containing particulars of the company's plant for industrial drying and electrostatic precipitation.

Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, E.C.4.—A 20-page catalogue dealing with primary cells and batteries.

Fry's (London), Ltd., 24, King Street, E.1.—A leaflet describing new "Enox" conduit and cable cutting hacksaws.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A leaflet dealing with improved designs of protected-type plugs and sockets.

Anglo-Swiss Electrical Co., 15, Victoria Street, London, S.W.1. —Reprint from the *Journal of Scientific Instruments* on a miniature portable universal three-component vibration meter.

Ionic Alkaline Batteries, Ltd., 26, High Street, Stratford, E.15. —A leaflet on the "Ionic" hand lamp.

David Landale, 36, Great King Street, Edinburgh.—A descriptive leaflet on the new "Swifsure" saw.

Charles Selz, 47, New Cavendish Street, W.1.—A card giving particulars of an exhibition of lampshades being held at the showrooms at the above address.

Fuller Accumulator Co. (1926), Ltd., Woodland Works, Chadwell Heath, Essex.—Two posters advertising h.t. and l.t. radio accumulators.

Bankruptcy Proceedings

J. O. Grant, electrical engineer, lately of 63, Queen Victoria Street, E.C., and Strathspey Park Road, Shenfield.—This debtor attended on January 18th at the London Bankruptcy Court for public examination upon accounts showing liabilities of £525 and assets of £7. In reply to Mr. Cresswell, Assistant Official Receiver, the debtor stated that he began business in 1890 at 63, Finsbury Pavement. In 1910 he was joined by a partner, and they afterwards carried on business together as "J. O. Grant & Taylor" at 63, Queen Victoria Street. Witness retired from the firm in December, 1932, and had since been without occupation. He attributed his failure to a judgment for £500 with costs obtained against him last August in respect of a cash loan in 1925. He was unable to meet the liabilities and the creditors made him bankrupt. The examination was concluded.

C. I. Morris, radio dealer, 39-41, Parker Street, Kingsway, and Stal House, Judd Street, W.C.—The public examination of this debtor was held on January 19th at the London Bankruptcy Court, the accounts showing liabilities of £651 against assets "cash at bankers 5s. 4d." Replying to Mr. Bruce Park, Assistant Official Receiver, the debtor stated that he traded from 1922 to September, 1931, and had since been employed as a traveller in electrical goods at a salary and commission. In March, 1933, judgment was given against him in an action brought by him to recover damages for breach of contract, and in consequence these proceedings ensued. To that adverse judgment he attributed his failure and insolvency.

J. R. K. August, electrical engineer, 9, Downsview Road, Upper Norwood, Surrey.—Receiving order made January 11th on a creditor's petition.

A. E. Douch and **M. G. Willis** (Douch & Willis), 109, High Street, Dover, radio and electrical engineers.—The receiving order herein was made on the debtors' own petition recently, and according to the joint statement of affairs lodged there are gross liabilities of £349, of which £336 is expected to rank for dividend, and the assets are estimated to realise £336, leaving a deficiency of 4s. 9d. The separate estate of Douch shows unsecured creditors for £8 and assets valued at £1, whilst that of Willis discloses no assets and liabilities of £9.

H. Baxter, "Breachwood," Ball Green, Norton, Staffs, formerly trading as a wireless engineer and electrician at 21, Biddulph Road, Pittshill, Staffs.—This debtor attended for his public examination at the Town Hall, Hanley, Stoke-on-Trent, on January 18th. His statement of affairs showed gross liabilities of £342, all of which were expected to rank for dividend, and there were net assets of £32, leaving a deficiency of £310. Debtor attributed his failure to losses on returned wireless sets and family illness. The examination was closed.

B. Hetherington, wireless dealer, Westgate, Elland, Yorks.—First and final dividend of 1s. 6½d. in the £, payable January 23rd at 71, Manningham Lane, Bradford.

C. G. Smith, electrical contractor, 66, Lichfield Street, Wolverhampton. — Supplemental dividend of 3s. 4d. in the £, payable January 24th at 34, Waterloo Road, Wolverhampton.

R. C. Stevens, wireless dealer, The Green, Billingham.—Receiving order made January 15th on debtors' own petition.

J. E. Roberts (Roberts & Goldthorpe), engineer and electrician, Crosland Moor Mills, Huddersfield.—Trustee, Mr. H. N. Bostock, Union Bank Chambers, Huddersfield, released December 21st.

P. F. Chipps, electrical engineer, 6, Oak End Way, Gerrards Cross.—Trustee, Mr. J. B. Simmons, 8, Forbury, Reading, Official Receiver, released January 1st.

F. J. Woolfenden and **J. D. Lister** (Frank Woolfenden & Lister), electrical and radio engineers, 56, Victoria Street, Littleborough.—Last day for receiving proofs for dividend, February 3rd. Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver.

J. Stewart, radio dealer, 10, Murton Street, Murton Colliery.—Last day for receiving proofs for dividend, February 3rd. Trustee, Mr. W. A. Ellis, 32, Frederick Street, Sunderland, Official Receiver.

Company Liquidations

English Overstrung Piano Co., Ltd.—The compulsory winding up order was made against this company upon the petition of Marconi's Wireless Telegraph Co., Ltd., and the statutory first meetings of the creditors and shareholders were held on January 19th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. A statement of affairs was submitted showing liabilities of £8,388 against assets of £233, and a deficiency of £8,653 with regard to contributories. The chairman reported that the company was formed in July, 1922, with a capital of £500, to carry on business as pianoforte manufacturers and dealers, but in 1931 it also produced wireless receivers. After some 500 had been produced it was realised that the cost was higher than had been estimated, and that the receivers were unsatisfactory. Other types were produced but they also proved unsatisfactory. They were sold with a twelve months' guarantee, which involved the company in great expense. Later, the company entered into agreements with Marconi's Wireless Telegraph Co., Ltd., and Standard Telephones & Cables, Ltd. On November 2nd, 1932, the company's auditors suggested that it should go into voluntary liquidation, and at a meeting of the shareholders a resolution to that effect was passed and a liquidator was appointed, but the Marconi and Standard Companies launched an action to recover royalties due to them; judgment for £2,480 with costs was obtained, and the petition for a compulsory liquidation followed. The liquidation was left in the hands of the Official Receiver.

W. & E. Peek, Ltd., 14, King Edward Buildings, Hendon Lane, Church End, Finchley, N., electrical engineers, &c.—At the statutory meeting of creditors, a statement of affairs was presented showing liabilities of £787, and net assets of £151, leaving a deficiency of £636. It was stated that the business was established some years ago. About two years ago it was extended into the motor trade, and additional premises were taken, a limited company being formed. The company had a nominal capital of £2,000, and shares to the value of £1,000 were issued to the vendor in consideration of the assets transferred. It was anticipated that the cash creditor shown on the statement of affairs would withdraw his claim. Resolutions were passed confirming the voluntary liquidation of the company, with Mr. C. Hayter, 87, Newman Street, W., as liquidator, with a committee of three of the creditors.

Sheringham & District Electric Supply Co., Ltd., Andover & District Electricity Co., Ltd., Yarmouth (I. of W.) Electricity Supply Co., Ltd., and the **Southwold Electricity Supply Co., Ltd.**—Meetings February 19th at 11, Tothill Street, S.W.1, to receive an account of the winding-up by the liquidator, Mr. H. Hockley.

Tetbury Electric Supply Co., Ltd., Malmesbury Electric Supply Co., Ltd., and the **Warminster Electric Supply Co., Ltd.** —Meetings February 19th at 11, Tothill Street, S.W.1, to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

Northern Electrical Wholesalers, Ltd.—Winding up voluntarily. Liquidator, Mr. J. W. F. Rutherford, Exchange Buildings, Whitehead Street, South Shields.

Fredk. Hodgson & Co., Ltd.—Particulars of claims by February 2nd to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Hampton Radio, Ltd.—Meetings February 20th at 11, Queen Victoria Street, E.C., to receive an account of the winding up by the joint liquidators.

Cecil Cooper & Co. (London), Ltd.—Particulars of claims by February 2nd to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Dissolution of Partnership

Monarch Radio Service, 28, Tramway Street, Leeds.—Messrs. J. F. Ellis and R. Phoenix have dissolved partnership. Mr. Phoenix will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Aylesbury.—FRINGE ORDER.—The Town Council has approached the Elecericity Commissioners with a view to ascertaining whether they will give favourable consideration to an application for a Fringe Order permitting the Council to supply electricity to Piddington.

Bedford.—OVERHEAD LINES.—The Corporation is to erect an l.p. overhead line at Wood End, Kempston, and an 11,000 V overhead line at Great Barford.

Bishop's Stortford.—TRANSFER OF UNDERTAKING.—The transfer of the Bishop's Stortford, Harlow and Epping Gas and Electricity Company's undertaking to the North Metropolitan Electric Power Supply Company has now been approved by the Electricity Commissioners.

Blackpool.—CABLES.—Subject to the approval of the Corporation, a scheme to substitute underground cables for overhead wires at Blackpool at a cost of £8,000 is recommended by Preston Electricity Committee.

Brighton.—SUPPLY EXTENSIONS.—In order to augment the supply of electricity to the Whitehawk School it is proposed to spend £1,363 on mains and a 250 kVA transformer. The extension of electricity to Newtimker at a cost of £867, and also to the Hotel Metropole at a cost of £2,661, has been approved.

Caernarvon.—NORTH WALES POWER BILL.—The Corporation has decided not to oppose this Bill.

Canada.—INCREASING ELECTRICITY CONSUMPTION.—Mr. D. C. Durland, President of the Canadian General Electric Company, recently stated that more than a third of Canada's thirty-five principal industries are ninety per cent. electrified, whilst twenty-seven industries have a ratio of more than eighty per cent. Canadian industry as a whole is more than seventy-six per cent. electrified. Many industries are practically one hundred per cent. electrified, among these being the cotton, silk, rayon fabric and rayon yarn manufacturing industries. The extent to which electricity is used in the mining and metallurgical industry is indicated by the fact that this industry uses between thirteen and fourteen per cent. of the total power generated by Canadian central stations. Last year was characterised by a considerable increase in the use of electric steam generators, particularly in the pulp and paper industry, as an economical means of providing process steam. To the end of 1933 approximately 1,400,000 kW in electric steam generators had been installed in Canada. Many new installations were made in 1933. The number of wired homes in Canada at the end of last year totalled more than 1,500,000, representing three-quarters of all of the houses in Canada.

Cannock.—FRINGE ORDER.—The Urban District Council has applied to the Electricity Commissioners for a Fringe Order for the supply of electricity to the parish of Hazel Slade.

Carlisle.—EXTENSION.—The City Council is to extend the electricity system to Walton Village, and has applied to the Electricity Commissioners for their approval.

Chester.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £4,225 for the provision of the main transmission line between the Queensferry power station and the sub-station in New Crane Street.

Chichester.—RELIEF MAIN.—The City Council has applied to the Electricity Commissioners for permission to provide a relief main running from Westmead Estate to a switching station at Sidlesham, in connection with a bulk supply to the Bognor Gas and Electricity Co.

SUPPLY FOR SEWAGE PUMPS.—The Council has offered a supply of electricity for the sewage pumps for the Selsey drainage scheme, at 1½d. per kWh.

Chiswick.—PURCHASE OF UNDERTAKING.—The Chiswick local authority has given notice of its intention to purchase the Chiswick area of the Chiswick Electricity Supply Corporation's undertaking.

Corby.—STATION LIGHTING.—The L.M.S. Railway Co. has applied to the Kettering Urban District Council for a supply of electricity for the purpose of lighting the new sidings at Corby.

Eastry.—ELECTRICITY SUPPLY.—The Rural District Council has consented to houses at Eastry being wired for electric light at no expense to the ratepayers. At Great Mongeham thirty-seven residents have agreed to take a supply of electricity, and the Council will offer no objection to the use of overhead lines by the South-East Kent Electric Power Co.

Exeter.—LOAN.—The Electricity Committee has obtained sanction to a loan of £5,000 for house-wiring installations under the assisted wiring scheme.

Gainsborough.—LOAN.—The Urban District Council has applied for a loan of £7,000 for mains and services.

Glasgow.—WIRING PROGRESS DURING DECEMBER.—Under the Electricity Department's scheme, 186 houses were wired in December, making the total to date 38,566, and hired appliances numbered twenty-three, bringing the total to 17,588.

MAINS EXTENSIONS.—The Electricity Committee has agreed to have distributing mains laid at a cost of £5,565.

Hartley Wintney.—SPECIAL ORDER WITHDRAWN.—The Rural District Council, at the request of the Mid-Southern Utility Co., has withdrawn its objection to the company's application for a Special Order extending the area of supply by including a portion of South Warnborough. Residents at Hook, Rotherwick, and Eversley had asserted that the company was not using its powers to supply these parishes with electricity, but the company is taking steps to meet the demands of residents at Hook and Rotherwick, and the Council has also decided not to object to the erection of overhead l.p. lines at Rotherwick.

Hemel Hempstead.—SUPPLY TO COUNCIL HOUSES.—The Rural District Council has accepted the quotation of the Luton Corporation electricity undertaking for supplying electricity to Council houses at Flamstead, with overhead lines at the rear of the houses.

Houghton.—FLOODLIGHTING A COLLIERY.—The Houghton Main Colliery Co. last week began the floodlighting of the pithead and gear, which has been painted an aluminium shade. The colliery stands on the east of the L.M.S. Railway about a mile north of Darfield, between Sheffield and Leeds, and night travellers are afforded a very impressive spectacle.

Floodlighting at the Houghton Main Colliery

Hull.—REDUCED TARIFFS.—The Electricity Committee has decided to adjust the existing tariff to provide that all electricity consumed in excess of 30 kWh per quarter per £ of rateable value shall be charged at ¾d. per kWh. The quarterly rental for wash boilers is to be reduced from 5s. to 3s. 6d.

LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £96,500 for mains and services.

India.—SCHEME FOR A MADRAS TOWN.—A scheme to supply electricity to the town of Tiruvottiyur, in the Madras Presidency, is under consideration. The town is about six miles from Madras city, and has a population of about 11,000.

Irish Free State.—SHANNON SCHEME.—The flow of the Shannon has now become normal again, and the turbines are working at full capacity at Ardnacrusha, reports our Irish correspondent. In this connection Dr. Probst, chief technical adviser of Siemens-Schuckert, has arrived at Ardnacrusha for the purpose of carrying out an electrical test on the turbines, which work will occupy some six weeks. A mechanical and governor test of the turbines is also to be carried out by a member of the firm of Voith, Germany.

Kettering.—GRID LINE.—The Central Electricity Board's transmission line from Northampton to Kettering is expected to be completed by the end of February.

COOKERS.—There are now nearly twelve hundred electric cookers in use in the area supplied by the Electricity Department.

Letchworth.—REDUCED CHARGES.—The First Garden City, Ltd., has addressed a circular to all consumers under the "all-purpose" scheme in Letchworth, Norton and Willian notifying them of changes under Scale "C," to come into operation after the March meter reading. No meter rents will be charged to quarterly consumers on the "all-purpose" rate. "Unit" charges will be reduced to ¾d. per kWh in the two summer quarters, but will be charged at 1d. per kWh in the two winter quarters as at present. Fixed charges will be amended in accordance with a revised schedule.

Lincolnshire.—RURAL SUPPLY.—The North Lincolnshire and Howdenshire Electricity Co. will shortly take a supply to Brigg and Caistor. The constructional work in connection with a supply is now in hand in parishes in the Isle of Axholme and in the vicinity of Gainsborough.

London.—ST. MARYLEBONE.—The Health Committee reports that with the restricted operation of the generating station under the South-East England Scheme, the steam supply for the large disinfector at the cleansing and disinfecting station will only be available during from four to six months of the year, and the Committee proposes therefore to introduce an electrically-operated steam boiler at an estimated cost of £400

The Electricity Committee recommends that rising mains be installed in ninety-five flats at a cost of £400.

STOKE NEWINGTON.—The Electricity Committee is applying for sanction to borrow £5,000 for the purchase of electricity meters.

BATTERSEA.—The Electricity Committee is to provide services to 138 premises at an estimated cost of £1,170. The Elec-

tricity Commissioners have sanctioned the borrowing of £28,000 in respect of rental wiring installations.

FULHAM.—The Electricity Committee is applying for sanction to borrow £10,000 for rental wiring and £10,000 for mains extensions.

ST. PANCRAS.—The Electricity Committee is to extend mains at a cost of £554.

INQUIRY POSTPONED.—The Electricity Commissioners have given notice that the inquiry which was to have been held on January 29th at the Institution of Electrical Engineers with reference to the draft Order entitled the "London and Home Counties Electricity District (Amendment) Order, 1934," has been postponed to a date to be fixed later.

Luton.—SCHOOL LIGHTING.—The Borough Education Committee has included in its estimates a sum of £1,825 for installing electric lighting in schools at present illuminated by gas.

Northern Ireland.—BELFAST.—A provisional agreement has been arrived at between the Corporation and the Harbour Commissioners in the matter of the transmission of current from the Corporation power house at Musgrave Channel to the County Antrim side of the Harbour, it being decided to use submarine cables under the harbour channel-way at the Twin Islands.

Donaghadee.—UNDERTAKING TAKEN OVER.—The Electricity Board of Northern Ireland took over the town's electricity undertaking on January 1st. Under the Board's tariff rate, which is in operation from January 1st, the flat-rate charge for electricity is reduced from 10d. to 8d. per kWh.

MOURNE.—The installation of the plant which is to supply Mourne and district with electricity is almost completed.

Portsmouth.—PURCHASE OF UNDERTAKING.—The Town Council is recommended by its Finance Committee to purchase from the Gosport Borough Council the electricity undertaking at the same price as Gosport is to pay to the Gosport and Alverstoke Company. Portsmouth is to supply Gosport on the same terms as those in force at Lee-on-the-Solent and other outlying districts.

Rotherham.—ELECTRIFICATION OF WORKS.—By the setting in motion last week of a 500-h.p. motor to drive the forge mill, the works of the Midland Iron Co., Ltd., at Rotherham, have now been completely electrified.

Scotland.—THE GRAMPIAN SCHEME.—The Grampian Electricity Supply Co. announces that the second stage of its Grampian hydro-electric works, involving the construction of a generating station at Tummel Bridge, has now been completed. The installed plant in the station has a capacity of 34,500 kW, and this, coupled with the generating station at Ericht, which has been supplying electricity for three years, will make a total plant capacity of 66,500 kW. The two generating stations together constitute the largest hydro-electric development in the British Isles for the purpose of general supply. A network of h.p. transmission lines has been provisionally planned for transmitting electricity through the most important centres of population in the Scottish Highlands, and good progress is being made with the initial stages of this work. Supplies of electricity are already available in Banchory, Munlochy, Avoch, Fortrose, and Rosemarkie, and it is expected that supplies will be available in Nairn, Forres, Stonehaven, and Laurencekirk at an early date. The company is to canvass the districts through which the transmission lines will pass, and canvassers are to be accompanied by a demonstration van, equipped with the domestic and other electrical appliances. The company proposes making an intensive campaign among farmers and hotel-keepers.

Southend-on-Sea.—GAS OR ELECTRICITY?—The local gas company having offered to lay the main and services free to each house on the Leigh Estate, the Town Council has asked the Electricity Committee if it is prepared to provide a service and wire the houses for heating and cooking under the same conditions, tenants to be allowed to make their own choice.

SUPPLY TO WAKERING.—The borough electrical engineer is to consider and report on a request for a supply of electricity for Great Wakering, made by the local Ratepayers' Association.

Walthamstow.—REDUCED CHARGES.—The Electricity Supply and Lighting Committee has resolved that the supply charges be amended as from the reading of the meters terminating the December quarter, as follows:—Ordinary lighting: Flat rate for the first 250 kWh per quarter, 4d. per kWh; for all in excess of 250 kWh per quarter, 3½d. per kWh. Domestic supplies: Primary charge as at present; secondary charge, where no cooker is installed, as at present, two-thirds of a penny per kWh; where a cooker is installed, ½d. per kWh. Shop and office lighting: Maximum demand charge as at present. Secondary charge at 1d. per kWh (a reduction of ¼d. per kWh). Hospital lighting: Flat rate at 2½d. per kWh (a reduction of ½d. per kWh).

Ware.—SUPPLY TO INSTITUTION.—Herts County Council reports that negotiations have taken place with the North Metropolitan Electric Power Supply Co. for the supply of electricity

"Ring out the old, ring in the new." Gas lamps going to their rest at Southend after their replacement by electric lighting

to the Ware Institution, and terms now agreed for a supply are a fixed charge of 26s. per kVA per quarter, plus 1.3d. per kWh for the first 6,000 kWh per quarter, all energy over 6,000 kWh per quarter being charged at 0.8d. per kWh.

Warrington.—FRINGE ORDER.—The Electricity Committee is to seek a Fringe Order to provide supply to Dunham Massey and Dunham Woodhouses.

Weymouth.—MAINS EXTENSIONS.—The Town Council has decided to carry out mains extensions at an estimated cost of £2,015.

CHANGE-OVER.—Authority has been given for changing over the supply system in the following areas:—From and including the Westham Housing Estate to Cromwell Road, and on the Dorchester Road to Westerhall.

Wood Green.—STREET LIGHTING.—The Highways Committee recommends that an installation of "Osira" gas discharge lamps be installed at a cost of £1,384.

Traction

Australia.—VICTORIA RAILWAY IMPROVEMENTS.—A Railway Loan Application Bill which has been approved by the Victoria Legislative Assembly includes £14,687 for providing an automatic telephone exchange at Spencer Street station, Melbourne, £27,800 for additions and improvements to the electrical equipment of suburban lines, and £65,000 for automatic couplings.

TROLLEY BUSES FOR HOBART.—According to Mr. R. J. Harvey, a member of the Hobart City Council and of its Tramway Committee, the municipality will shortly place trolley buses on one of the routes.

Blackburn.—BUSES REPLACE TRAMS.—The change-over from trams to buses has been approved and will be begun in the Audley district.

New Poplar Swimming Baths

THE well-equipped Poplar swimming baths which were opened this week were built on the site of one of the oldest public baths in England, originally erected in 1851. Electricity plays a large part in the new building, which has been constructed at a cost of £113,000, the electrical installation having been carried out in co-operation with the Electricity Department under the supervision of Mr. G. E. Jesson, the power and heat engineer.

Besides a number of rather unusual features, such as electrically operated windows and stage curtains, the whole of the cooking is done by electricity, and there are twenty electric clocks and two electric ticket machines. The scrubbing and wax polishing of the floor is also done electrically, while electric power is used to operate hoists for raising and lowering the 1,400 seats with which the hall is provided, and for the cinema and radio equipment.

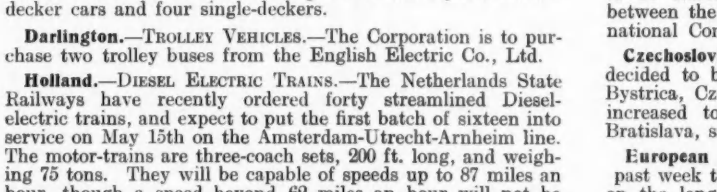
To the visitor the most effective demonstration of the use of electricity is the elaborate scheme of exterior floodlighting. The floodlighting projectors are supported by concrete poles which also carry the lanterns for the ordinary street lighting on the side of the pole. During the winter the bath is covered by a sprung floor, thus converting the hall into an entertainment hall suitable for dancing or shows utilising the stage at the end of the hall, the special lighting for which is controlled from a central switchboard. Illustrations appear on page 121.

Bristol.—PURCHASE OF TRAMWAYS.—The City Council has had under discussion the proposed purchase of the Bristol tramways at a cost of £1,765,890. No decision has yet been reached, but it was pointed out that the figure did not include the necessary purchase of new tramcars costing £500,000, and that the undertaking could have been bought for £670,000 in 1914.

Burnley.—SALE OF TRAMCARS.—Trams formerly run on the Colne and Nelson route, now covered by buses, are to be sold for scrap by Burnley, Colne and Nelson Joint Transport Committee. The Committee is offering for sale twenty-five double-decker cars and four single-deckers.

Darlington.—TROLLEY VEHICLES.—The Corporation is to purchase two trolley buses from the English Electric Co., Ltd.

Holland.—DIESEL ELECTRIC TRAINS.—The Netherlands State Railways have recently ordered forty streamlined Diesel-electric trains, and expect to put the first batch of sixteen into service on May 15th on the Amsterdam-Utrecht-Arnheim line. The motor-trains are three-coach sets, 200 ft. long, and weighing 75 tons. They will be capable of speeds up to 87 miles an hour, though a speed beyond 62 miles an hour will not be attempted in the initial service. Thirty-five of the sets will



This electric locomotive has recently been put into service on the Italian State Railways. It is equipped with six motors totalling 2,600 h.p.

be equipped with two 410-h.p. engines, while the remaining five will have two 375-h.p. engines. The engines are to be built in Holland under licence. The trains, stated Mr. Hupkes, are to be fitted and upholstered on luxury lines.

Irish Free State.—DUBLIN TRAM STRIKE.—The tram strike, which was commenced last Thursday week by members of the Amalgamated Transport and General Workers' Union because some employés had joined an Irish union, ended on Saturday. The members of the Transport Union decided to resume work pending the result of a meeting of the Trades Union Congress.

Leicester.—TRAMS TO GO?—The Tramways Committee is to consider the supersession of the trams by buses.

Rotherham.—TENDERS INVITED.—The Town Council is to invite tenders for the fitting of six tramcars with new bodies and air brakes.

Russia.—RAILWAY ELECTRIFICATION.—Plans are being prepared for the electrification of the Murman Railway between Kandalaks and Murmansk, a distance of 186 miles. The object is to facilitate the transport of minerals. The supply of power, estimated at 22,000 kW, will be obtained from the Neva hydro-electric works.

ELECTRIC TROLLEY-BUSES.—Two trolley-buses have been completed at the Jaroslav factory, but information regarding the results of tests is not yet available.

South Africa.—NEW TRAMCARS FOR JOHANNESBURG.—The City Council has accepted the tender of Vickers and Metropolitan Carriage (South Africa), Ltd., for the supply of two new tramcars at a total cost of £9,975. Both will be of the all-metal light-weight type, with revolving seats. One will have a two-motor four-wheel swing axle and the other a four-motor eight-wheel radial arm bogie. They are intended for experimental purposes.

RAILWAY ELECTRIFICATION.—The Railway Administration has announced that the electrification of the Cape Flats line is to be proceeded with immediately. The electrified line will extend from Maitland on the Cape Western main line to Diep River on the Capetown-Simonstown electric line, and it is hoped to have the scheme completed by the end of March this year. This will complete the electrification of all the suburban lines in the Cape Peninsula.

Traffic Signals.—The Denbighshire Standing Joint Committee has decided to install traffic actuated signals at the Wynnstay Corner, Wrexham, at a cost of £570, and to provide at various points in the county similar signals costing £1,890.

The St. Marylebone Highways Committee recommends an expenditure of £10,596 for the provision of traffic signals.

The Hastings Town Council has decided to have automatic traffic signals installed at the Albert Memorial, the junction of White Rock and Robertson Street, and the junction of Grand Parade and London Road, at a cost of £2,760.

The Exeter Corporation is to provide further traffic signals costing £5,000.

Communications

Australia.—TELEPHONES AS WEDDING PRESENTS.—A *Reuter* message from Sydney says that henceforward the Deputy-Director of Posts and Telegraphs will remit £1 of the annual rental in cases where a telephone service for twelve months is given as a wedding present.

Cyprus.—TELEPHONE SYSTEM TO BE INAUGURATED.—A *Reuter* message from Nicosia says that the installation of an urban and inter-urban telephone system throughout the colony is to be started immediately under an agreement concluded between the Government of Cyprus and Imperial and International Communications, Ltd.

Czechoslovakia.—NEW BROADCASTING STATION.—It has been decided to build a 30-kW broadcasting station at Banska Bystrica, Czechoslovakia. Ultimately, the power may be increased to 100 kW with the closing of the station at Bratislava, says *The Wireless World*.

European Broadcasting.—THE LUCERNE PLAN.—During the past week there has been some improvement in the situation on the long-wave band. Huizen is still occupying its old wavelength, but does not cause much interference since it is occupying the wavelength allotted to Brasov, a Roumanian station which has not yet increased its power. The Russians have now changed over in accordance with the plan, and Daventry is free from interference, but the Warsaw station is now in a difficult position. It refused to occupy its allotted wavelength (230 kc), and this has now been "poached" by Luxembourg, yet all the time it remains on its old wavelength it suffers interference from the Eiffel Tower, which should be on a medium wave. On the medium-wave band there appears to be little or no interference now, and reception during the past week has been clear and strong.

France. — NEW HIGH-POWER STATION.—According to *The Wireless World*, a site has been chosen for the French 120-kW regional station in Brittany. During the construction of the new station the Rennes transmitter, which it replaces, may be temporarily increased to a power of 40 kW.

Germany.—TELEPHONIC COMMUNICATION WITH RAILWAY TRAINS.—The *Journal Télégraphique* reports that arrangements have recently been completed whereby it is possible for passengers on the trains running between Berlin and Hamburg to be placed in telephonic communication with exchanges in Switzerland, and *vice versa*.

Great Britain.—TELEPHONE PROGRESS.—The final figures for telephone development during 1933 show that there was a net increase of 78,927 stations, as compared with an increase of 65,577 stations during 1932.

TELEPHONE CALLS TO BELGIUM.—The Postmaster-General announces that subscription calls are now available in the Anglo-Belgian telephone service throughout the day and night except between 10 a.m. and 1 p.m. Subscription calls are established at a fixed time daily under an agreement for at least a month. They are chargeable at half the day rates during the night (7 p.m. to 8 a.m.), and at the full day rates when admitted during the day in the Anglo-Belgian service, from 8 to 10 a.m. and from 1 to 7 p.m.

RADIO RELAYS.—The Stoke Newington Highways Committee recommends the refusal of an application from Wireless Services, Ltd., for permission to erect wires in the borough.

Holland.—STATE ACQUISITION OF PRIVATE TELEPHONE SYSTEMS.—The *Verkehrsnachrichten für Post und Telegraphie* reports that the Dutch Government authorities have decided to acquire the public telephones in Amsterdam, Rotterdam and The Hague, the only three remaining privately owned systems in the country.

Northern Ireland.—BELFAST.—The Postmaster-General, Sir Kingsley Wood, opened the reorganised telegraphic department of the Belfast head post office on January 18th. The new system operates practically all the Belfast telegraph circuits by teleprinter, and includes a voice-frequency installation on the Northern Ireland-Great Britain cables which provides eighteen telegraph channels from one telephone circuit.

Poland.—CONSTRUCTION OF STATIONS DELAYED.—The construction of the new 17-kW Poznan transmitter has been postponed through a delay in the delivery of apparatus, but it is hoped to begin transmissions at the end of this month. The new Torun transmitter is not likely to begin to radiate before the summer.

Portugal.—NEW BROADCASTING STATION.—A new British-designed 20-kW station is being built at Parede, and will broadcast on 431 metres. The estimated cost is £30,000, and it is hoped to make the first transmissions during February.

South Africa.—NEW CAPETOWN STATION OPENED.—The Earl of Clarendon, Governor-General of the Union, opened the new high-power broadcasting station at Capetown on January 15th.—*Reuter* (Capetown).

South America.—TELEPHONIC COMMUNICATION.—Telephonic communication has recently been established between Asuncion (Paraguay) and Buenos Aires (Argentina) *via* Encarnacion and Posadas.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Post and Telegraph Department. March 13th. Various insulated wires. (A.Y. 12172.)*
March 20th. Telephone protective apparatus of various types. (A.Y. 12186.)*
Bell sets and portable telephones. (A.Y. 12169.)*
City Council. March 12th. Totally enclosed metal-clad switchgear. (A.Y. 12170.)*
March 26th. Supply of three-phase, 6,600-V, metal-clad switchgear, suitable for rupturing 250,000 kVA. (A.Y. 12185.)*
BRISBANE.—February 7th. City Electric Light Co., Ltd. 44-kV switchgear. (A.Y. 12092.)*
City Council. March 2nd. Two 11,000-V 3-phase metal-clad switchboards. (A.Y. 12184.)*
SYDNEY.—February 28th. New South Wales Department of Railways. One 500-kW rectifier unit. (A.Y. 12182.)* Remote control equipment for a rotary convertor and five reclosing d.c. feeder equipments. (A.Y. 12183.)*

Bedford.—February 12th. Electricity Department. E.h.p., h.p., and l.p. cables, and electric lamps for the year ending March 31st, 1935. (See this issue.)

Belgium.—BRUSSELS.—February 23rd. Municipality. Supply and installation of a 20,000-kW steam turbo-generator. Particulars and plans (125 fr.) from 11, Rue Ste. Catherine.

Blackburn.—February 26th. Electricity Committee. Cable, rubber-insulated wire and consumers' meters for twelve months. (January 19th.)

Burton-on-Trent.—January 31st. Corporation. Underground and overhead cables. (January 5th.)

Cheadle & Gatley.—February 9th. Electricity Department. Various materials during the year ending March 31st, 1935. (See this issue.)
February 12th. One 6,600-V truck cubicle and metering equipment. (See this issue.)

Egypt.—ALEXANDRIA.—February 26th. Ministry of Communications. Cable, switchgear, transformers, hauling winches and motors. (A.Y. 12094.)*
CAIRO.—February 3rd. Ministry of Public Works. Electrically driven reciprocating pump. (G.Y. 13311.)*
February 12th. One 25-kW 110-V d.c. turbo-generator set for the Royal Yacht. (A.Y. 12171.)*

Erith.—February 5th. Electricity Department. H.p. and l.p. switchgear and other apparatus for sub-station equipment. (January 12th.)

Hamilton.—February 5th. Electricity Department. E.h.p. metal-clad compound switchgear, two 300-kVA transformers, and one kiosk, &c. Specifications, &c., from W. J. Cooper, burgh electrical engineer, Electricity Department, Almada Street. Tenders to Town Clerk.

Harrogate.—February 24th. Electricity Department. Stores for twelve months commencing April 1st, 1934. (See this issue.)

Hastings.—February 20th. Electricity Department. Various materials for the year ending March 31st, 1935. (See this issue.)

India.—SIMLA.—February 22nd. Director of Contracts, Army Headquarters. Eighteen electric motors, 1½ to 50 h.p. (See this issue.)

London.—ST. PANCRAS.—February 8th. Borough Council. Traffic signals. (January 12th.)
HAMMERSMITH.—February 28th. General electrical stores, &c., for twelve months. (January 19th.)

Manchester.—January 31st. Electricity Committee. Economisers, switch units, oil-immersed reactors, and voltage-variation equipment. (January 12th.)
January 31st. Manufacture, delivery and laying of 33,000-V cable and auxiliary pilot cable between Barton power station and Sale sub-station. (January 19th.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. February 6th. 71,000 dry cells for telephone use. (A.Y. 12101.)*
February 13th. Twenty-four 0-8430-ohm rheostats. (A.Y. 12.103.) Fifty miles of tinned copper v.i.r. wire. (A.Y. 12108.)*
February 19th. 1,000 ebonite or bakelite telephone earpieces. (A.Y. 12133.)*
February 19th. Inset transmitters, bakelite mouthpieces and microtelephone plungers for automatic table telephones. (A.Y. 12131.)*
March 13th. 3,000 four-conductor telephone cords. (A.Y. 12149.)*
March 14th. Telephone instrument cords. (A.Y. 12177.)* 2,640 ft. of v.i.r. telephone cable. (A.Y. 12178.)*
March 15th. Twenty-six 2-V 130-Ah cells. (A.Y. 12152.)*
March 27th. Public Works Tenders Board. One set each of 110-kV and 33-kV outdoor switching equipment and steelwork for these. (A.Y. 12180.)*
Public Works Department. April 24th. Four mimic bus panels to control four 110-kV oil circuit-breakers. (A.Y. 12176.)*

Northern Ireland.—BELFAST.—March 5th. Electricity Board. 33-kV and 11-kV overhead transmission lines, new l.p. distribution systems, and reconstruction of existing l.p. systems. (See this issue.)

Plymouth.—February 8th. Corporation. Meters, time switches, underground cable, transformers, e.h.p. and l.p. switchgear. (January 12th.)

Runwell (Essex).—February 28th. East Ham and Southend-on-Sea Joint Visiting Committee. Electrical installation at Mental Hospital. (December 22nd.)

Salford.—February 10th. Electricity Department. Stores, including electric kettles, fires, water heaters, wash boilers, &c. (See this issue.)

South Africa.—PRETORIA.—March 2nd. City Council. Turbo-alternator, condensing plant and auxiliaries, boilers and electrically operated crane. (December 22nd.)
February 2nd. Government Supplies Board. Telephone material comprising terminal window blocks, outdoor distribution boxes, sub-station protectors, standard terminal blocks and condensers. (A.Y. 12161.)
February 16th. Telephone switchboards for private branch exchanges. (A.Y. 12165.)* Underground armoured cables, covered wire, copper wire, &c. (A.Y. 12166.)*
February 16th. Six level measuring sets and six audio-frequency oscillators. (A.Y. 12168.)*
BULAWAYO.—February 1st. Municipality. One 4,000-kW turbo-alternator, switchgear, and transformers. (A.Y. 12122.)*
JOHANNESBURG.—Railways and Harbours. February 26th. Fog-signalling plant consisting of a Diesel-engine driven d.c. generator, a d.c. motor driven 150-cycle, a.c. generator, and an atmospheric acoustic emitter with accessories. (A.Y. 12174.)*
February 19th. Two-ton electrically driven overhead travelling crane. (A.Y. 12181.)*

Southend-on-Sea.—February 8th. Electricity Department. General stores for twelve months. (January 12th.)

Stoke-on-Trent.—February 7th. Electricity Department. E.h.p. switchgear and transformers for twelve months. (January 19th.)

Swansea.—February 8th. Electricity Department. Sulphur and dust extraction plant, lime plant and ash plant for Tir John power station. (January 5th.)
February 8th. Two motor-driven reciprocating air compressors and receivers for Tir John power station. (See this issue.)
February 16th. Stores for twelve months from April 1st, 1934. (See this issue.)

Torquay.—February 5th. Corporation. Twelve months' supply, from April 1st, of electric lamps, &c. Tenders on forms provided to be delivered to the Borough Engineer.

---

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bournemouth.—Transport Committee. Accepted. Cable for trolley-bus equipment (£2,580).—W. T. Glover & Co., Ltd. Twelve fifty-six-seater trolley vehicles (£2,135 each).—Sunbeam Motor Car Co., Ltd.

Brighton.—Electricity Committee. Recommended. Electric lift for boiler house at Southwick power station (£992).—Penrose Lifts, Ltd.
Works Committee. Recommended. Electric lift in Shelter Hall (£425).—Marryat & Scott, Ltd.

Carlisle.—Electricity Committee. Accepted. Two 600-kVA transformers (£522).—Brush Electrical Engineering Co., Ltd.

Douglas.—Electricity Committee. Accepted. Erection of a h.p. line from Quarter Bridge to Union Mills; 25-kVA transformer.—Johnson & Phillips, Ltd.

Government Contracts.—The following contracts were placed by the various Government departments during December:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Accumulators.—Batteries, Ltd.
Batteries.—Siemens Bros.
Cells.—D.P. Battery Co.; Chloride Electrical Storage Co.
Electric wharf cranes.—Stothert & Pitt, Ltd.
Electric overhead travelling cranes.—T. Smith & Sons (Rodley), Ltd.; J. Adamson & Co.
Motor generating sets for electric welding.—Met.-Vick. Electl. Co.
Electric lamps.—G.E.C.; Siemens Electric Lamps & Supplies; B.T.-H. Co.; Ediswan.
Micanite sheet, tubing &c.—Attwater & Sons; Micanite & Insulators Co.; Mica Mfg. Co.; A. Pearce & Co.
Hydraulic electrically-driven pump.—Hydraulic Engineering Co.
E.h.p. switchgear.—B.T.-H. Co.
Main switchgear.—Whipp & Bourne, Ltd.
Switches.—H. W. Sullivan, Ltd.; Walters Electrical Mfg. Co.; W. McGeoch & Co.; Whipp & Bourne, Ltd.; Veritys, Ltd.
Insulating adhesive tape.—Connollys.
Transmitters, &c.—R.I., Ltd.; Siemens Bros.; Marconi's.
Tuners and amplifiers, &c.—R.I., Ltd.; H. W. Sullivan, Ltd.
Wireless valves.—Mullard Radio Valve Co.

WAR OFFICE.
Electric lamps.—B.T.-H. Co.

AIR MINISTRY.
Accumulators.—Batteries, Ltd.; Chloride Electl. Storage Co.
Generators and spares.—Haslam & Newton, Ltd.
Generators.—Rotax, Ltd.
Rectifiers.—Marconi's.
Insulation testers.—Evershed & Vignoles, Ltd.
Transmitter-receivers and receivers.—Marconi's.
W/t. valves.—A. C. Cossor, Ltd.

POST OFFICE.
Telephonic apparatus.—Automatic Elect. Co.; Ediswan; Ericsson Telephones, Ltd.; G.E.C.; Phœnix Telephone & Elect. Works; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.
Testing and protective apparatus.—Phœnix Telephone & Elect. Works; Telephone Mfg. Co.
Wireless apparatus.—Standard Telephones.
Terminal blocks.—Thomas de la Rue & Co.
Cable.—B.I. Cables; Henleys; Siemens Bros.; Standard Telephones; United Telephone Cables.
Vacuum cleaners.—British Vacuum Cleaner & Engg. Co.
Loading coils.—Standard Telephones.

Leclanché depolarising elements.—Atlas Carbon & Battery Co.; B.I. Cables; Ediswan; Fuller Accumulator Co. (1926); G.E.C.; I.R.G.P. & Teleg. Works; Siemens Bros.
Electric lighting fittings.—G.E.C.
Rectifiers.—Ediswan.
Transformers.—Standard Telephones.
Electric lighting.—Mount Pleasant New Building, E.C.1: A. Hawkins & Sons.
Electric passenger lift.—Kensington automatic telephone exchange, Chelsea, S.W.3: W. Wadsworth & Sons.
Telephone exchange equipment.—Colindale (London); Trafford Park (Manchester): Ericsson Telephones, Ltd. Ilford (London); North (London): Siemens Bros. Sub-contractors: Chloride Electl. Storage Co. for batteries; Electric Construction Co. for generators and ringing machines. Brixton (London); Banbury; London Tele. "A" Exchange G.P.O. (South): Standard Telephones. Carmarthen: Automatic Electric Co.
Telephone repeater equipment, Hull, Manchester: Standard Telephones.

H.M. OFFICE OF WORKS.

Engineering services.—Birmingham district—electrical engineering labour in day work: E. Cooper. Main cable installation in Research Station, Garston, nr. Watford: Pirelli-General Cable Works. 3, Sanctuary Buildings, S.W.1: Fretwell Heating Co.

CROWN AGENTS FOR THE COLONIES.

Cable (underground) for crane feeders.—Callender's Cable & Cons. Co.
Cable.—G.E.C.
Copper wire.—Macintosh Cable Co.
Electric motors, starters, &c.—Met.-Vick. Electl. Export Co.
Radio distribution equipment.—G.E.C.
Telephone apparatus.—G.E.C.
Transformer.—Brush Electl. Engineering Co.

London.—ST. PANCRAS.—Contracts and Stores Committee. Cables (£222).—Standard Telephones & Cables, Ltd.

Lye.—Worcestershire Education Committee. Accepted. Installation of electric lighting at Orchard Lane School (£118).—Abell & Smith's Electrical Co.

South Africa.—CAPE TOWN.—Electricity Committee. Recommended. Twelve electric ranges (£229).—C. H. Shaw, Ltd. Twelve 150-kVA transformers (£96 each) and three 50-kVA transformers (£63 each).—Wilson & Herd, Ltd.

Southend-on-Sea.—Town Council. Accepted. Transformer kiosks for one year.—General Electric Co., Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, January 26th. Grand Hotel, Birmingham. 7 p.m. Presidential Address by Mr. J. Parkinson.

Electrical Engineers' Ball.—Friday, January 26th. Grand Hotel, Harrogate. 8 p.m.

Electrodepositors' Technical Society.—Friday, January 26th. Comedy Restaurant, W.1. Annual Dinner.

Electrical Association for Women.—Monday, January 29th. Club Room, London. 7.30 p.m. "Ultra-violet Rays and Sun Lamps." Mr. W. A. Jones.

Institute of Transport.—Tuesday, January 30th. Institution of Electrical Engineers, London. 6 p.m. Informal Meeting. Discussion on "Traffic Light Control Signals." Opened by Mr. J. S. Pool Godsell.

Edinburgh Electrical Society.—Wednesday, January 31st. Visit to Transformer Department of Messrs. Bruce Peebles & Co.

British Electrical Development Association.—Wednesday, January 31st. Caxton Hall, London. 7.30 p.m. "The Art of Public Speaking." Mr. Elliott Stone.

E.L.M.A. (Lighting Service Bureau).—Wednesday, January 31st. Savoy Hill, W.C. 7 p.m. Discussion on "Church Lighting." Mr. H. C. Wheat.

Institution of Electrical Engineers.—Thursday, February 1st. Institution, London. 6 p.m. "Reserach in the British Post Office." Mr. B. S. Cohen. (*North-Eastern Students' Section*).—Saturday, January 27th. 2.30 p.m. Visit to works of Messrs. R. Hood, Haggie & Son, Willington Quay. Friday, February 2nd, Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Students' Lecture. "Domestic Electrical Apparatus from an Engineering Point of View." Mr. F. H. Clough. (*North-Eastern Centre*).—Monday, January 29th. Rendez-Vous Restaurant, Newcastle-on-Tyne. 7 p.m. Informal Meeting. Discussion on "Load Building." (*North Midland Students' Section*).—Tuesday, January 30th. Hotel Metropole, Leeds. 7.15 p.m. Joint meeting with Graduates of the Institution of Mechanical Engineers. "Remote Control of Machinery." (*North-Western Students' Section*).—Tuesday, January 30th. Engineers' Club, Manchester. 7.15 p.m. "Private Power Plant." Mr. J. M. Saunders. Saturday, February 3rd. 2.30 p.m. Visit to the works of Messrs. Ferguson, Pailin, Ltd., Manchester. (*South Midland Centre*).—Wednesday, January 31st. Town Hall, Loughborough. Faraday lecture on "The Electrical Engineer and the Free Electron." Mr. C. C. Paterson. (*Meter and Instrument Section*).—Friday, February 2nd. Institution, London. 7 p.m. "Grid Metering." Mr. J. Henderson. (*North Midland Centre*).—Friday, February 2nd. Royal Victoria Hotel, Sheffield. 7.30 p.m. Engineers' Dance.

Electrical Trades Commercial Travellers' Association.—Friday, February 2nd. Criterion Restaurant, W.1. 6.30 p.m. for 7 p.m. Annual Dinner.

Faraday House Old Students' Association.—Friday, February 2nd. Midland Hotel, St. Pancras. 7.30 p.m. Annual Dinner-Dance.

Makers' Names Wanted

ISOLANTITE porcelain material.
LECTRIC toaster.

Notes

I.E.E. Dinner at Manchester

The annual dinner of the North-Western Centre of the Institution of Electrical Engineers was held at the Midland Hotel, Manchester, on Tuesday last. Mr. G. G. L. Preece, chairman, presided, and 316 members and guests were present. Sir Andrew Duncan, chairman, Central Electricity Board, in proposing "The Institution," said that he was impressed with the spirit of enthusiasm and vitality among power authorities. While he admired the skill and enterprise which had led to the development of this great industry he looked to the Institution to encourage the younger brains to develop the economic and social side. While there were vaster worlds to conquer, the Central Board would be kept fully occupied for the present in consolidating its position. Responding, Mr. P. V. Hunter, C.B.E., President, referred to the strength of the North-Western Centre, which was always regarded as the most important provincial centre. The toast of the guests was proposed by the chairman. Sir William Ray, responding, said that the recent improvement in public health was, in the main, due to good water and good sanitation, and he looked to electricity to complete the trio in the near future by providing a pure atmosphere. Dr. S. L. Pearce proposed the chairman's health.

Mining Electrical Engineers' Dinner

The annual dinner of the South Wales branch of the Association of Mining Electrical Engineers was held at Cardiff on January 20th, Mr. J. B. J. Higham, A.M.I.E.E., chairman of the branch, presiding over a large company. Mr. F. Llewellyn Jacob, chairman of the Monmouthshire and South Wales Coal-owners' Association, in proposing the toast of the Association, referred to the many changes in the method of working coal. The modern colliery was one big engineering shop which required trained men to look after its machinery, and he believed much valuable training could be done by the method adopted by the Association. Major E. Ivor David, past-president, responding in the absence through ill-health of the president, Mr. Rooke Ainsworth, said that the accident rate was invariably low when the Association membership was high. The technical complexity of modern mining machinery was such that most managers had as much as they could do to keep pace with the mining side of their work, and they had to rely on men who had specialised in electrical or mechanical engineering.

Mr. W. A. Hutchings, branch vice-president, proposed "Kindred Societies and the Guests," to which Mr. A. Nichols Moore, chief electrical and tramways engineer, Newport, and Capt. J. Macleod Carey, H.M. Divisional Inspector of Mines and president of the South Wales Institute of Engineers, replied. The toast of "The Chairman" was proposed by Mr. Howard Williams, branch vice-president.

Static Electricity in Printing

The Technical Committee of the Federation of Master Printers has asked the Printing Industry Research Association to undertake an inquiry into the difficulties caused in printing offices by static electricity. At certain times trouble is experienced in feeding paper into the printing machine on account of its clinging to the feed board and to other sheets in the pile. Difficulties also arise through sheets clinging to the delivery mechanism and to other newly printed sheets, giving rise to "offset." A questionnaire has been sent out to some members of the printing trade asking for information on a great many points.

Institute of Transport Dinner

The annual dinner of the Institute of Transport will be held on February 16th, at 6.30 for 7 p.m., at the Connaught Rooms, Great Queen Street, W.C., when Mr. W. Whitelaw, president of the Institute, will preside. The principal guests will be Lord Macmillan and Mr. Oliver Stanley, Minister of Transport.

"A Power Station for Sale"

Last week when commenting on the offer for sale of Aylesbury power station we referred to the taking of a bulk supply from "Luton." This does not mean Luton Corporation but the grid sub-station at that point. The Central Electricity Board has been giving a supply to Aylesbury for about four years under a temporary arrangement which has proved so satisfactory that on the starting of trading conditions in the South-East England Area at the beginning of the year Mr. W. A. Turnbull decided that the station could be disposed of.

Fatalities

The falling of an overhead line in Armagh, Northern Ireland, caused the death of two boys on January 19th. When the line, which was charged at 11 kV, fell into the street, one of the boys picked it up and received a fatal shock. The other went to his assistance and met a similar fate.

The Association of Engineers (India)

The Association of Engineers, in Calcutta, has removed to 2, Royal Exchange Place (3rd floor), Calcutta.

Appointments Vacant

Male assistant superintendent of traffic in the London Telephone Service, and male assistant traffic superintendent in the Provinces.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. Selley, sales engineer to Messrs. Venner Time Switches, Ltd., is in hospital for an operation on his foot, but the company has arranged that during his absence from business, which will be for about a month, his customers' requirements will receive attention as usual.

[*Elliott & Fry*

Lord Herbert Scott, who, as announced in our last issue, has been nominated to succeed Sir George Macdonogh as President of the Federation of British Industries

Mr. Edgar S. Barralet, of Messrs. Pinchin, Johnson & Co., Ltd., fractured an elbow in a recent accident and he will be unable to follow business affairs actively for a week or two. His many friends in the electrical trade will join us in wishing him a speedy recovery.

Mr. N. F. T. Saunders, B.Sc., A.M.I.E.E., has resigned his position with the General Electric Co., Ltd., and has joined the works designs staff of the Gramophone Company, Hayes, Middlesex.

Mr. John Brass has been unanimously re-elected president of the Institute of Mining Engineers for the ensuing year.

At the meeting of the Institution of Electrical Engineers in London on January 18th, a copy of Sir William Orpen's painting of the late Sir Charles Parsons was presented to the Institution by **Viscount Falmouth.** In making the presentation, Viscount Falmouth referred to the many portraits in the Institution Hall of men who had been prominent in the development of the electrical industry. Of the names of the men who had built up the industry one of the most honoured was that of Sir Charles Parsons, who was an honorary member of the Institution and also a Faraday Medallist. Throughout Parsons's busy life he had never lost sight of the electrical side of the development of the turbine, and towards the close of his life he did a considerable amount of work in the development of the high-voltage alternator. It was not, however, as an electrical engineer pure and simple that the name of Parsons would go down to posterity. He would be looked upon as the man who made the steam turbine a practical proposition. It was in 1884 that Parsons built his first turbine, but it was not until 1900 when the Elberfeld machines were started that engineers began to have confidence in the turbine and to realise that in the steam turbine they had a prime-mover capable of development in size and possessing many considerable technical advantages.

Mr. P. V. Hunter, the President, in accepting the painting on behalf of the Institution, said that there could be a no more fitting subject for this honour than Sir Charles Parsons. In addition to being an honorary member and a Faraday Medallist, he was Vice-President of the Institution in 1913-14, and it would also be remembered that Sir Charles had presented the Institution with the magnificent portrait of Sir Joseph Swan.

Mr. J. W. Leach, M.I.E.E., is resigning his position as manager of the London office of the British Thomson-Houston Co., Ltd., in order to take the post of deputy chief engineer with the Westminster Electric Supply Corporation, Ltd., on February 1st. Mr. Leach's connection with the B.T.-H. Co. began about thirty-two years ago as a pupil, and through his duties at Rugby and in the South of England he has come into close contact with large numbers of engineers and others in the electrical and allied industries, who will join us in wishing him a full measure of success with the Westminster undertaking.

Mr. J. W. Leach

Though Mr. Leach's change-over will be a loss to the manufacturing and business sides of the electrical industry, it will unquestionably provide London electricity supply with an important and very welcome accession to its personnel.

Mr. R. Westwater, B.Sc., of Edinburgh, has been awarded the sixth studentship (valued at £300) offered by Messrs. Mavor & Coulson, Ltd., through the Institute of Mining Engineers, for 1933-34. The company is presenting a similar studentship for 1934-35.

Mr. L. L. Robinson, borough electrical engineer, Hackney, has intimated to the Council that he is desirous of retiring on superannuation as from January 24th, 1934, but has offered to continue to act in a temporary capacity until such time as his successor is appointed and commences his duties with the Council. He has also undertaken, in view of the fundamental constitutional changes which are taking place as a result of the fixing of the "appointed day" by the Central Electricity Board for taking over the Hackney power station as a "selected" station, to assist the Council in a consultative capacity in the future, if required, after the termination of his appointment. The Establishment and General Purposes Committee was to recommend to the Borough Council, at its meeting to be held on Wednesday last, that the Council should accede to Mr. Robinson's request; that, subject to the concurrent report of the Finance Committee, a payment of 500 guineas should be made to him in recognition of the additional services rendered in connection with the recent extensions to the electricity undertaking; and that he should be appointed temporary borough electrical engineer as from January 24th, at a salary at the rate of £2,000 per annum until such time as his successor is appointed. Mr. Robinson, who went to Hackney in the year 1901, has completed thirty-three years' service, and he supervised the recent extensions to the power station, which cost approximately £450,000. He is a member of the Institutions of Electrical, Civil and Mechanical Engineers.

[*Elliott & Fry*

Mr. L. L. Robinson

Mr. H. Maughan has been appointed by Messrs. Drake & Gorham, Ltd., as sales engineer for their switchgear products in the counties of Lancashire, Cheshire, Westmorland and Cumberland. Mr. Maughan will be stationed at the company's office at 29, Piccadilly, Manchester.

Mr. J. S. Highfield,—We were glad to hear from Mr. M. Whitgift at last week's Batti-Wallahs' luncheon that Mr. Highfield's health has considerably improved and he has been able to return to his country home.

Mr. J. W. Wilson has retired from Messrs. C. A. Parsons & Co., Ltd., after forty years' service with the company, and has been presented with a gold watch. For thirty-one years he was foreman of various departments in the works, but latterly he has been foreman of the Heaton Works Apprentice Training School. The presentation was made by Mr. F. G. H. Bedford, managing director of the company.

Mr. R. H. Darbyshire, telephone manager of the Witwatersrand district, South Africa, has retired after forty-four years' service. He began his career on the telegraph side in England in 1890, and was transferred to the Cape in 1895. He became superintendent of the training school, a position which he held for nine years, and on the formation of a departmental training committee acted as its secretary. From 1923 he was principal clerk of the telegraph and telephone branch at the head once of the Posts and Telegraphs Department in Pretoria, and was appointed telephone manager of the Witwatersrand district in 1929. The increase in the num-

[*Lafayette*

Mr. J. W. Meares, who opened the discussion on "Water Storage for Reserve Power" at the informal meeting of the I.E.E. on Monday last

ber of telephones in that district to 38,000 has been largely due to the efforts of a departmental committee of which Mr. Darbyshire was chairman. He and Mrs. Darbyshire are shortly leaving for an extended holiday overseas. Mr. Darbyshire is succeeded by **Mr. W. A. McGuffog**, of the headquarters staff of the Department in Pretoria.

Col. T. M. Banks, C.B., has been appointed Director-General of the Post Office, and **Mr. T. R. Gardiner** Deputy Director-General.

Obituary

Mr. C. O. Varley.—Mr. Cromwell Oliver Varley, M.I.E.E., died from pneumonia on January 12th at St. James, Goldsworth, Woking. He was elected an Associate of the Institution of Electrical Engineers in 1882, and had been a member since 1886. He was in his seventy-sixth year.

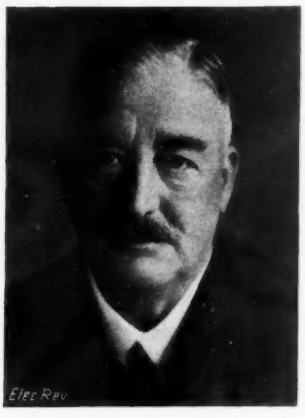
M. Henri de Pistove.—The death has occurred in Paris, at the age of fifty-three years, of M. Henri de Pistove, a well-known French electrical engineer, for many years connected with the Breguet Co., the Compagnie Electro-industrielle and the French Thomson-Houston Co.

Mr. J. Knight.—The death occurred on January 14th, at the age of fifty-nine years, of Mr. James Knight, of Bromley, Kent, in which town he had been in business as an electrical engineer for about thirty-five years. The business will be continued by his son, Mr. Frank Knight.

Mr. A. W. Bridges, who had been in business on his own account at Carliol House, Newcastle-on-Tyne, as a battery manufacturer, has died at Newcastle, aged fifty-six. He was formerly the Newcastle representative of a well-known battery firm for seventeen years, but started on his own account in 1921.

Mr. K. Mori.—The death occurred in Japan, on January 19th, of Mr. Kengo Mori, formerly Financial Commissioner of the Imperial Japanese Government in London, Paris and New York. He was chairman of the Japan Electric Security Co. and financial adviser to the Tokyo Electric Co. and the Toho Electric Co.

Mr. J. G. B. Stone.—We regret to record the death of Mr. John G. B. Stone on January 23rd at his home in Mayfair, W. Mr. Stone, who was in his sixty-sixth year, was on the board of many electricity supply and tramway companies, and his chairmanships included the Calcutta Tramways Co., Ltd., the Electric Supply Corporation, Ltd., the Cawnpore Electric Supply Corporation, Ltd., the Madras Electric Supply Corporation, and the Madras Electric Tramways (1904), Ltd.



[*Elliott & Fry*
The late Mr. J. G. B. Stone

Lord Aberconway, who was chairman of the Metropolitan Railway until it was taken over by the London Passenger Transport Board, died on January 23rd at his London home, at the age of eighty-three. He was a director of numerous companies, and was a vice-president of the Federation of British Industries and the British Electrical and Allied Manufacturers' Association.

Mr. E. Worthington.—The death occurred on January 23rd, at the age of seventy-seven, of Mr. Edgar Worthington, late secretary of the Institution of Mechanical Engineers.

Will.—Mr. H. A. Vernet, chairman of the British Power & Light Corporation, former deputy-chairman of the Underground Electric Railways Co., and a director of several other companies, left £169,909 (net personalty £152,619).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Parolle Electrical Plant Co., Ltd.—Private company. Registered January 17th. Nominal capital, £500,000 in £1 shares. Objects: To enter into contracts for the provision and execution of plant and works, and to guarantee the performance or lend money on the security of or in connection with any such contracts; to acquire and hold shares, stocks, debentures and securities of any company constituted or carrying on business in the United Kingdom or elsewhere (in particular any company carrying on business as manufacturers of or contractors for electrical or other plant or works); to acquire and deal in lands, buildings, business undertakings, patents and licences, &c. The subscibers are: N. Booth and L. W. Jobson, both of Pilgrim House, Newcastle-on-Tyne. Registered office: Pilgrim House, Pilgrim Street, Newcastle-on-Tyne.

Owens Battery Equipment, Ltd.—Private company. Registered January 15th. Capital, £6,250 in 1s. shares. Objects: To acquire the exclusive right to manufacture and sell electric storage batteries and/or their component parts and/or processed oxides in the United Kingdom, the Irish Free State, India, and the British Empire (except Canada and Newfoundland) under a process by Arthur G. Owens, electrical engineer, of Toronto, Canada, to adopt an agreement with the Federated Trust & Finance Corporation, Ltd., and to carry on the business of electricians, electrical and mechanical engineers, manufacturers of and dealers in electrical appliances, batteries, &c. The subscribers are: F. J. Groombridge, 67, Badlis Road, Walthamstow, E.17; and H. E. Callow, 62, London Wall, E.C.2. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Griff Batteries, Ltd.—Private company. Registered January 12th. Capital, £3,500 in 1,000 7½ per cent. cumulative preference shares of £1 each and 10,000 ordinary shares of 5s. each. Objects: To acquire the business of manufacturers and repairers of and dealers in electrical accumulators, batteries and their component parts and electrical equipment for motor cars, wireless apparatus, &c., carried on by W. R. Hopkins and S. W. Spawforth as "Griff Products." The directors are: W. R. Hopkins, 55, South Villas, Camden Square, N.W.; S. W. Spawforth, 14, Homestead Park, Dollis Hill Lane, Cricklewood, N.W.2; and E. B. Jones, Homeleigh, Wellacre Road, Kenton, Harrow. Registered office: Stock Orchard Works, Stock Orchard Street, Caledonian Road, N.

L. M. K. Manufacturing Co., Ltd.—Private company. Registered January 12th. Capital, £7,500 in £1 shares. Objects: To acquire the business of manufacturers, importers and exporters of and dealers in scientific, mechanical, electrical and wireless instruments, apparatus, accessories, and scientific, electrical, mechanical, wireless and general engineers, now carried on by the L. M. K. Mfg. Co. at Cambridge Yard, Cambridge Road, Hanwell, Middlesex. The subscribers are: P. B. Tiddeman, 11, Grays Inn Place, W.C.1; and R. G. Virgo, 18, Vicarage Way, Neasden, N.W.10. Registered office: Cambridge Yard, Cambridge Road, Hanwell.

Bettaway Lighting Co., Ltd.—Private company. Registered January 17th. Capital, £3,000 in 1,000 8 per cent. cumulative preference shares of £1 each and 8,000 ordinary shares of 5s. each. Objects: To acquire the business of an electrical engineer now carried on by Margaret L. Lewis at 70, Longfleet Road, Poole, Dorset, as the Bettaway Lighting Co. The permanent directors are: Margaret L. Lewis (chairman) and J. Hassip, both of 70, Longfleet Road, Poole, Dorset.

Radialaddin (Disposals), Ltd.—Private company. Registered January 17th. Capital, £1,000 in 950 10 per cent. cumulative preference shares of £1 and 1,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of, agents for and dealers in radio sets and appliances, gramophones, cinematograph producers, &c. The subscribers are: E. Godal, 4, Hyde Park Place, W.2; and Hilda M. Dome, 113, Haverstock Hill, N.W.3.

Besst Electrics, Ltd.—Private company. Registered January 12th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric wash boilers, cookers and other appliances, electrical and otherwise, for domestic and other purposes, &c. The directors are: J. B. Brown, Bank Hall, Sawley (chairman); E. Brown, 93, Ormerod Road, Burnley; and H. Howarth, 216, Burnley Road, Padiham. Secretary: H. Howarth. Registered office: 3, Parker Lane, Burnley.

Crystube Manufacturing Co., Ltd.—Private company. Registered January 18th. Capital: £1,000 in £1 shares. Objects: To carry on the business of manufacturers, wholesalers, and retailers in thermionic valves or tubes, radio accessories and sets of all kinds, mechanical, scientific and electrical inventions and apparatus, &c. The first directors are: J. S. Norris and Mrs. M. M. Norris, both of The Warren, Battle, Sussex. Registered office: The Warren, Battle.

A. C. Batchelor, Ltd.—Private company. Registered January 18th. Capital: £1,000 in £1 shares. Objects: To adopt an agreement with A. C. Batchelor, for the acquisition of the business carried on as Radio Sales & Service, Hillingdon Heath, and to carry on the business of radio dealers, electrical and wireless merchants, &c. The directors are: A. C. Batchelor, 20, Corwell Lane, Hillingdon, and J. B. Bunyard, 29, Hillingdon Road, Uxbridge. Registered office: Boundary House, Uxbridge Road, Hillingdon Heath, Middlesex.

Miller & Co. (Radio), Ltd.—Private company. Registered January 18th. Capital: £1,000 in £1 shares. Objects: To adopt an agreement with W. Miller and A. Rossall for the acquisition of the business now carried on as "Odeon Radio," at South Harrow, and to carry on the business of radio dealers, electricians, wireless merchants, &c. The directors are: A. Rossall, 52, Wood End Park Road, Hayes, Middlesex, and W. Miller, Boundary House, Hillingdon Heath, Middlesex. Registered office: Odeon Buildings, Northolt Road, South Harrow, Middlesex.

Mardens (Electric), Ltd.—Private company. Registered January 20th. Capital: £3,500 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electrical, radio, telegraphic, and telephonic apparatus, &c. The subscribers are: C. R. Marden, Electra, Priory Road, Loughton, Essex, and L. H. Findlay,

10/12, Walbrook, E.C.4. Secretary: A. H. Weatherfield, 10/12, Walbrook, E.C.4. Registered Office: Electric House, High Road, Loughton.

Duncan Engineers, Ltd.—Private company. Registered in Edinburgh, January 17th. Capital: £1,000 in £1 shares. Objects: To acquire the business of electrical engineers, carried on by A. I. & J. Duncan, at Quarry Street, Hamilton. The first directors are: A. I. Duncan, senr., Rowallan, Larkhall, A. I. Duncan, junr., 89, Bent Road, Hamilton, J. Duncan, 75, Bent Road, Hamilton, and G. I. Duncan, Rowallan, Larkhall. Registered office: 208, Quarry Street, Hamilton.

Electromagnets, Ltd.—Private company. Registered January 18th. Capital: £5,000 in £1 shares. Objects: To carry on business as electrical and mechanical engineers, designers and manufacturers of and dealers in electro-magnetic machinery, separators of all kinds, lifting magnets, clutches, chucks for all purposes, &c. The directors are: S. T. Pemberton, Norwood, Copt Heath, Knowle, E. L. Watson, Woodlands, Barford, Warwick, and W. E. Box, 246, Penns Lane, Erdington, Birmingham. Secretary: E. L. Watson. Registered office: 2, Church Street, Birmingham.

"Parex" Bakelite Products, Ltd.—Private company. Registered January 18th. Capital: £100 in 1s. shares. Objects: To acquire the business of a bakelite manufacturer and moulder, carried on by Evange Paroussi at 10, Featherstone Buildings, W.C.1, as "Parex" Bakelite Products. The directors are: W. J. Oliver, 5, Duncan Terrace, N.1, and E. Paroussi (permanent managing director), 19, Kelvin Road, N.5. Registered office: 10, Featherstone Buildings, High Holborn, W.C.1.

Returns of Electrical Companies

F. Smith & Son (Southampton), Ltd.—F. Woolley, 8/10, Portland Terrace, Southampton, ceased to act as receiver on January 10th, 1934.

Mersey Power Co., Ltd.—Particulars filed of 3½ per cent. debenture stock to secure £250,000 authorised November 14th, 1933, and covered by trust deed dated January 5th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued. Trustees: Law Debenture Corporation, Ltd.

"J.D." Insulating Co., Ltd.—Debenture, dated December 28th, 1933, to secure £5,000 charged on the company's property, present and future, including uncalled capital. Holders: F. H. Porter, Ltd., 5/15, Shaws Alley, Liverpool.

Great Eastern Electric Co., Ltd.—The nominal capital has been increased by the addition of £5.000 in £1 ordinary shares beyond the registered capital of £5,000.

British Lighting & Ignition Co., Ltd.—Capital, £100 in £1 shares. Return dated December 12th, 1933. Three shares taken up. £3 paid. Mortgages and charges, nil.

Peacehaven Electric Light & Power Co., Ltd.—Capital, £20,000 in 962 preference shares of £1, 14,038 preference shares of 12s., 192,564 ordinary shares of 1s., and 3,984 ordinary shares of 5s. Return dated July 4th (filed October 2nd), 1933. 13,383 12s. ordinary and 16,027 1s. ordinary shares taken up. £17,928 3s. 1d. paid (including £38 18s. 1d. paid on forfeited shares). Mortgages and charges, £5,770.

W. Mackie & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated September 28th, 1933. 7,500 shares taken up. £3.155 paid. £4,345 considered as paid. Mortgages and charges, nil.

Van Raden & Co., Ltd.—Capital, £10.000 in £1 shares. Return dated November 8th, 1933. 6,754 shares taken up. £4,654 paid. £2.100 considered as paid. Mortgages and charges, nil.

Costa Rica Electric Light & Traction Co., Ltd.—Capital, £130,000 in £1 shares. Return dated December 1st, 1933. All shares taken up. £7 paid. £129,993 considered as paid. Mortgages and charges, £242,590.

Lincoln Radio Relay Service, Ltd.—Issue on January 5th, 1934, of £700 debentures, part of a series already registered.

Hayward & Shepherd, Ltd.—Mabel C. Walker, 23, Kildare Gardens, W., ceased to act as receiver on January 9th, 1934.

Super Radio (Manchester), Ltd.—E. H. Lawlor, 57, Newearth Road, Walkden, Manchester, was appointed receiver and manager on January 13th, 1934, under powers contained in debenture dated December 23rd, 1932.

Reading Electric Supply Co., Ltd.—Satisfaction in full on January 1st, 1934, of trust deed dated March 4th, 1926, and registered March 22nd, 1926, securing £150,000 6 per cent. first mortgage debenture stock.

London & Provincial Neon, Ltd.—Particulars filed of debentures not exceeding £1,200 authorised December 15th, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,100.

British Carbons, Ltd.—The nominal capital has been increased by the addition of £1.000 in £1 ordinary shares beyond the registered capital of £1,000.

W. Sisson & Co., Ltd.—Capital: £50,000 in 5,000 preference, 38,000 ordinary, and 7,000 deferred shares, all of £1 each. Return dated July 20th, 1933. 4,375 preference, 31,711 ordinary, and 7,000 deferred shares taken up. £28,686 paid on 4,375 preference and 24,311 ordinary shares, £14,400 considered as paid on 7,000 ordinary and 7,000 deferred shares. Mortgages and charges: £4,077 11s. 3d.

Lithanode Co., Ltd.—Capital: £3,000 in £1 shares. Return dated October 25th, 1933. 2,327 shares taken up. £627 paid, £1,700 considered as paid: Mortgages and charges: £5,000.

Brilliant Neon, Ltd.—Capital: £100 in £1 shares. Return dated October 12th, 1933. Two shares taken up. £2 paid. Mortgages and charges: Nil.

Killamarsh & District Electric Supply Co., Ltd.—Capital: £6.000 in £1 shares. Return dated September 20th, 1933. 4,650 shares taken up. £4,650 paid. Mortgages and charges: Nil.

A.F.A. Accumulators, Ltd.—Capital: £5,000 in £1 shares. Return dated October 24th, 1933. All shares taken up. £1,251 paid, £3,749 considered as paid. Mortgages and charges: Nil.

City Notes

E. K. Cole, Ltd., have issued a circular giving particulars of proposals for the merging of its two classes of 7 per cent. preference shares. It is proposed to convert both classes into 7 per cent. cumulative participating preferred ordinary shares of £1 each. These shares, in addition to a fixed cumulative preferential dividend of 7 per cent., will be entitled, in conjunction with the ordinary shares, to participate in a further dividend of 3 per cent., making a maximum of 10 per cent. The directors further propose to increase the authorised capital to £500,000 by the creation of 100,000 7 per cent. cumulative participating preferred ordinary shares of £1 each, but they have no intention of issuing this capital at the present time. An interim dividend of 10 per cent. was recently paid on the issued ordinary shares, and if the present proposals are approved, the preferred ordinary shares will receive a further 3 per cent., making 10 per cent. in respect of the current financial year. It is pointed out that the ordinary shares will not be materially affected by the adoption of these proposals, inasmuch as it will no longer be necessary to apply 5 per cent. of the profits available for dividend on the ordinary shares to the redemption of the company's redeemable preference shares.

Turner & Newall, Ltd.—Presiding at the annual meeting, held on January 18th, Mr. S. Turner (chairman) said that there had been a considerable development in the application of electric welding by the use of electrodes during the last twelve months. The Quasi-Arc Co. had maintained its position as the leader in the new industry; two examples of electric welding carried out by that company were the all-welded ship *Peter G. Campbell*, and the approach structure to the new Tees Bridge, near Middlesbrough. The insulation business showed a steady but encouraging increase. Large contracts for the supply and erection of their insulating materials had been carried out at Barking, Battersea, and Dunston power stations, all new super-power stations under the Central Electricity Board's system.

Allen West & Co., Ltd., announce that it will be necessary to defer the payment of the dividend on the 7 per cent. cumulative participating preference shares due on January 31st.

J. & E. Hall, Ltd., report that after deducting management expenses, making provision for depreciation and adding £8,139 brought in, and transferring £10,000 from reserve, there is a balance of £13,271. A dividend of 6 per cent. is paid on the preference shares and £5,171 is carried forward.

Herbert Morris, Ltd., announce the half-year's payment to January 31st on the 6 per cent. (less tax) and 5 per cent. (tax free) preference shares.

The Yorkshire Electric Power Co. proposes to pay a final dividend of 5 per cent. on the ordinary stock, maintaining the distribution for the year at 8 per cent.

The Singapore Traction Co., Ltd., has recommended a dividend of 2 per cent. on the 7 per cent. cumulative preference shares on account of arrears.

The Quebec Power Co. has annoounced a final quarterly dividend of $0.25 on the common shares.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets find a good deal of business with which to occupy their energies. It is true that activity comes in somewhat spasmodic fashion, and, for this reason, members of the House maintain that for anyone to see his way in the present condition of world financial affairs is as difficult as ever it was. The eyes of finance continue to wait upon America, and upon the developments of the President's policy. Many people think that Mr. Roosevelt is trying one plan after another in order to see which of his experiments is likely to turn out to be the most advantageous. But others, and some in close touch with Washington, say that he is a shrewd and honest man, having a clear objective in his own mind, and working for the benefit of the social body of America rather than of the interests which cluster around Wall Street and the financial focus of New York. Certainly the holder of gold-mining shares, or anything connected with the gold-mining industry, has good reason to thank the fall in the price of the dollar.

The Trend of Investment

The repercussions of American business policy make themselves felt almost every business day upon the prices of Stock Exchange securities. The disposition previously mentioned here of investment to look ahead to the time when money shall become dearer, and, correspondingly, gilt-edged securities decline, is still in evidence. Nevertheless, so great is the abundance of money that quotations for the best-class securities yield very little ground. At this time of year the ingathering of the income tax generally has an effect upon Stock Exchange business, through the necessity that it entails of stocks and shares being sold in order to meet the claims of the Inland Revenue. This year, however, all the selling that is taking place on this account finds a remarkable power of absorption ready to accept whatever stock is offered. Improvements in the price of Central Electricity 3½ per cent. stock are worth more attention than would be paid to them in the ordinary way, in that they reflect the persistence of investors in their demand for securities, with a fixed date attached, which stand under par. This particular stock, although it is dated 1963-1993, and need not be repaid for nearly sixty years, commands greater popularity than the other issues of the Board that stand well above 100. A fall of 2 points in

London Passenger Transport "B" stock affords a second illustration of the same trend on the part of investment. People are a little afraid to hold stocks the prices of which stand substantially over 100, even though the return from these securities may be better than that which is offered by others bearing a lower rate of interest, but obtainable under 100.

Transport and Communication

Two stocks deserve the consideration of the speculative investor who is less concerned with present income than he is with the likelihood of capital appreciation in the years to come. One of these is London Passenger Transport "C" stock, quoted at 85. The second is Cables & Wireless 5½ per cent. preference, quoted at 73¼. In both cases the dividend outlook is uncertain. The present year is the first during which the London Passenger "C" stock has been in existence, and nobody yet can tell what this year's distribution is likely to be. Cables & Wireless preference received 2⅜ per cent. last year, and the combine is not making sufficient progress to warrant the assumption that the rate will be greatly in excess of this for the current twelve months. The stock is entitled to a cumulative dividend of 5½ per cent., but the monthly traffic returns do not encourage immediate hopes of substantial recovery. The December index number published the other day is 76.7 per cent., the best for 1933. The lowest last year was 65.9 for August—always a quiet month, of course, in the cable world. The index figure for last month, 76.7, is hardly good enough to warrant more than subdued optimism.

Stock Exchange rumours, however, have been toying with the idea that a yet wider combine is in contemplation, and that Cables & Wireless may become a unit in a huge amalgamation of communication and radio interests. The price of the ordinary stock strengthened to 26.

Anglo-American Telegraph & Telephone shares have risen 4½ to 120, International Telephone & Telegraph to 16. There is no stopping the rise in Great Northern Telegraphs, the price showing a further 20s. improvement this week at 35. Marconi Marines are better at 31s. 3d. Conferences are being held frequently to discuss the vexed question of cable rates. The Stock Exchange has taken the lead in formulating protests that have been made from the House, the Baltic, and several other City exchanges.

Electricity Supply Shares

Electric Supply Corporation shares have lost 1/6, going back to 78s. 9d., and this is the only change of consequence that has occurred in the group of electricity supply shares. North Eastern Electric preference are 6d. better at 34s. 6d. Lancashire Light & Power retain their rise at 37s. Bournemouth & Poole keep good at 78s. 9d. Electrical Distribution of Yorkshire went back to 47s. 6d. The Chiswick Electricity Supply Corporation has been served with notice to the effect that the Chiswick local authority intends to exercise its powers to purchase the Chiswick area of the company's undertaking. This will come into force on July 25th, and if agreement cannot be reached by negotiation between the parties, arbitrators will fix the purchase price. The £1 ordinary shares stand at 2½, and there are a quarter of a million of these. Whitehall Electric preference have come into renewed favour, the price improving 1s. 9d. to 20s. 6d.

Parolle Electric

A. Reyrolle & Company are taking £260,000 of the half-million pounds capital of Parolle Electric Plant Company, Limited, the interest in which has been acquired from the executors of the late Sir Charles A. Parsons. The Reyrolle Company has been paying annual dividends on its ordinary shares of 12½ per cent. for some years past. C. A. Parsons & Company, in which the new interest is being acquired by A. Reyrolle, is a private engineering and contracting company, with an authorised capital of £450,000.

Manufacturing and Equipment Shares

English Electric shares have been tolerably active, following upon their recent sharp rise. The improvement drew its inspiration from a statement that two groups on this side of the Atlantic had taken 250,000 of the shares from New York. Half of these, according to report, were bought by a well-known industrial undertaking, the other half by a syndicate which proposed to deal with the holding through Stock Exchange channels. This rumour was succeeded by a statement that the arrangements had fallen through in regard to the second half of the shares just mentioned, and, accordingly, the ordinary shares are back to 7s. 6d., the preference to 10s., showing falls of 1s. 3d. and 3s. 3d. respectively. Johnson & Phillips advanced to 22s. 6d. General Electric ordinary are a little easier at 45s., British Aluminium recovered to 31s. 9d., Henleys are a strong market at 6 5/16s. Prices of other shares in this section are steady, with few movements worthy of mention. Enfield Rolling Mills at 32s. 6d. are down by ninepence, and Ericsson Telephones at 64s. 3d. are a shade easier than they were. London Electric Wire Co. & Smith's ordinary at 18s. 6d., the preference at 26s. 6d., show no particular alteration. Telegraph Condenser ordinary at 23s. 3d. stand 3d. above the same company's preference shares. Hall's Telephone Accessories are changing hands at a guinea: Telephone Manufacturing at 4s. 1½d., and Telephone Rentals at 7s. 9d., are quietly steady. In the new issue group, Anglo-Portuguese Telephone have firmed up to 3s. 6d. premium.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1931.	1932.	Price, Jan. 23.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	—	3 16 3
Brompton Ordinary	1	8¼	7	34/–	—	4 2 4
Charing Cross Ordinary	1	8¼	7	34/6	—	4 1 2
Chelsea	1	8⅛	7	34/6	—	4 1 2
City of London	1	10	10	35/–	—	4 0 0
Clyde Valley	1	7	7	42/–	—	3 6 8
County of London	1	10½	10½	57/6	—	3 13 0
Edmundson's 7% Pref.	1	7	7	34/–	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	−9d.	3 16 0
Elec. Supply Corporation	1	11	11	78/9	−¼	2 15 8
Kensington Ordinary	1	8	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7	37/–	—	3 15 8
London Electric	1	9	7	34/6	—	4 1 2
Metropolitan	1	10	10	56/3	—	3 11 5
Midland Counties	1	7	7	40/–	—	3 10 0
Mid. Elec. Power	1	8	8	45/–	—	3 11 1
North Eastern Electric Ordinary	1	6	6	37/–	—	3 4 10
Do. 7% Pref.	1	7	7	34/6	+6d.	4 1 2
Northampton	1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13⅜	—	4 8 11
North Met. Elec. Ordinary	1	—	10	3½	—	3 1 6
Do. do. 6% Pref.	1	6	6	30/–	—	4 0 0
St. James' and Pall Mall	1	8	7	34/6	—	4 1 2
Scottish Power	1	8	8	2⅛	—	3 15 4
South London	1	8½	7	34/6	—	4 1 2
Westminster Ordinary	1	8⅛	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	+1/9	7 6 4
Yorkshire Elec.	1	8	8	47/6	—	3 7 3

Public Boards.

Central Electricity, 1950–70	...Stock	5	5	113	—	4 8 6
Do. 1955–75	... „	5	5	114	—	4 7 6
Do. 1951–73	... „	4½	4½	106	—	4 5 0
Do. 1963–93	... „	—	3½	94½	+½	3 14 1
London & Home Counties, 1955–75	„	4½	4½	108	—	4 3 4
London Passenger Transport, A	... „	—	4½	116	—	3 17 7
Do. do. B	... „	—	5	121	−2	4 2 8
Do. do. C	... „	—	—	85	—	—
West Midlands Joint Elec. 1948–68	„	—	5	114	—	4 7 6

Telegraph and Telephones.

American Tel. & Tel.	... $100	9	9	120	+4½	7 10 0
Anglo-Am. Tel. Pref.	... Stock	6	6	114xd.	+1½	5 5 3
Do. Def.	... „	1½	1½	28½xd.	—	5 5 3
Cables & Wireless 5½% Pref.	... „	2¾	2¾	73½	−1	3 14 8
Do A 7½% Ord.	... „	Nil	Nil	26	+1	—
Do. B. Ord.	... „	Nil	Nil	11	—	—
Globe Tel. and T. Ord.	... 10	Nil	2½	10	—	2 10 0
Do. do. Pref.	... 10	6	6	12	—	5 0 0
Great Northern Tel.	... 10	20	20	35	+1	5 14 4
Marconi-Marine	... 1	10	7½	31/3	+⅛	4 16 0
Oriental Telephone Ord.	... 1	12	12	3½	—	*3 16 10

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	... 5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	... 5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	... Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	510	+50	—
Do. do. Pref. Ord.	... „	8	8	147½	—	5 8 6
Brazil Traction	... 100	—	—	13	—	—
Brit. Columbia Elec. Rly. Pce.	... Stock	5	5	100½	—	4 19 6
Mexico Trams, 5% Bonds	... —	5	5	22½	—	22 4 4
Mexican Light Common	... 100	Nil	Nil	5½	—	—
Do. 7% Pref.	... 100	7	7	11	—	—
Do. 1st Bonds	... —	5	5	47½	—	10 10 6
Victoria Falls Ord.	... 1	15	20	5½	—	3 12 9
Yorkshire (West Riding)	... 1	Nil	Nil	16/6	+6d.	—

Manufacturing Companies.

Assoc. Elec. Ord.	... 1	4	4	20/6	−9d.	3 18 3
Do. Pref.	... 1	8	8	31/3	—	5 2 5
Babcock & Wilcox	... 1	14	9	43/9	—	—
British Aluminium Ord.	... 1	5	5	32/6	+9d.	3 1 6
British Insulated Ord.	... 1	15	15	75/–	—	4 0 0
Brush Ord.	... Stock	Nil	Nil	42½	—	—
Callender's	... 1	15	15	65/–	—	4 12 4
Do. 6½% Pref.	... 1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord.	... 5/–	22½	12½	22/6	—	—
Do. 8% Pref.	... 1	8	8	32/6	+⅛	4 18 6
Edison-Swan 1st Pref.	... 1	7½	7½	24/6	—	£ 2 5
Do. 5% Deb.	... Stock	5	5	102½	—	4 17 7
Electric Construction	... 1	Nil	Nil	10/–	—	—
Enfield Cable Ord.	... 1	25	25	97/6	+⅛	5 2 5
English Electric	... 1	Nil	Nil	7/6	−⅛	—
Do. do. Pref.	... 1	Nil	Nil	10/–	−3/3	—
Ever Ready	... 5/–	35	35	30/3	+9d.	5 15 8
Ferranti Pref.	... 1	7	7	27/3	—	5 2 9
G.E.C. Pref.	... 1	6½	6½	30/6	−6d.	4 5 3
Do. Ord.	... 1	8	8	45/0	−9d.	3 11 1
Henley's	... 1	30	30	6⅛	+⅛	4 15 6
Do. 4½% Pref.	... 5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	... 1	—	—	15/–	—	—
Johnson & Phillips	... 1	5	5	22/6	+⅛	4 9 0
Siemens Ord.	... 1	7½	6½	20/9	−⅛	—
Telegraph Construction	... £1	Nil	Nil	27/6	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

7993. "Accumulator electrodes." Bleindustrie Akt.-Ges. Vorm Jung & Lindig and E. M. Schneider. March 17th, 1932. (403701.)

13730. "Systems of electric motor control." International General Electric Co., Inc. May 15th, 1931. (403622.)

14341. "Alternating current dynamo-electric machines, more particularly, but not exclusively, for welding plant." A. F. Fekete. May 20th, 1931. (403706.)

14894. "Telegraphic and similar repeating systems employing vacuum tube amplifiers." Electrical Research Products, Inc. June 25th, 1931. (403677.)

15010. "Reduction of interference in thermionic valve circuits." Electric and Musical Industries, Ltd., and P. W. Willans. May 26th, 1932. (403709.)

15989. "Photo-electric devices." British Thomson-Houston Co., Ltd. June 4th, 1931. (403626.)

17175. "Arrangement for the regenerative braking of d.c. motors." Allmänna Svenska Elektriska Aktiebolaget. June 18th, 1931. (403686.)

17220. "Radio receivers." Telefunken Ges für Drahtlose Telegraphie. June 17th, 1931. (403629.)

17316. "Electric conductors." F. H. M. Bennett. June 18th, 1932. (403688.)

17860. "Interrupters for the ignition apparatus of internal combustion engines." J. Lucas, Ltd., and E. A. Watson. June 24th, 1932. (403659.)

17902. "Electric snap-action switches." J. Y. Johnson (Arrow-Hart & Hegeman Electric Co.). June 24th, 1932. (403663.)

18062. "Method of, and apparatus for, the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Metallges Akt.-Ges.). June 27th, 1932. (403665.)

18164. "Cathode ray and like electric discharge devices." Electric & Musical Industries, Ltd., and M. Bowman-Manifold. June 27th, 1932. (403671.)

18176. "Cable and the like telegraph systems." Electrical Research Products, Inc. July 25th, 1931. (403694.)

18289. "A.c. induction electricity meters." Measurement, Ltd., and F. Holden. June 28th, 1932. (403716.)

18548. "Traffic control signals." Automatic Electric Co., Ltd., and P. B. Renshaw. June 30th, 1932. (403720.)

18592. "Electrical recording instruments." O. N. Phillips Elliott Bos. (London), Ltd., and G. F. Shotter. July 1st, 1932. (Cognate application 22503/32.) (403725.)

18623. "Gas, electric and like fires or radiators and the fabrication thereof." Pressed Steel Co. of Great Britain, Ltd., and E. B. Fernberg. July 1st, 1932. (Cognate application 27913/32.) (403727.)

19585. "Control of the motors of electrically propelled vehicles." Guy Motors, Ltd., and W. A. Stevens. July 11th, 1932. (403747.)

20452. "Mains-driven electric clocks." General Electric Co., Ltd., and H. C. Turner. July 19th, 1932. (403755.)

22238. "Photo-electric cells." International General Electric Co., Inc. August 8th, 1931. (403763.)

24621. "Electric horns." Butlers, Ltd., and A. Reeves. September 3rd, 1932. (403771.)

26094. "Permanent magnets." Darwins, Ltd., and W. L. Marrison. September 20th, 1932. (403778.)

26668. "Electric cables." Croydon Cable Works, Ltd., and H. R. Allen. September 26th, 1932. (403779.)

27553. "Means for signalling or controlling the timing and sequence of operations." W. G. Cleghorn. October 4th, 1932. (403783.)

30136. "Thermally controlled switch-operating mechanism." Leland Electric Co. November 16th, 1931. (403790.)

34438. "Electric cooking apparatus." British Thomson-Houston Co., Ltd. December 4th, 1931. (403800.)

34448. "Multi-position electric switches, such as for controlling electric motors." Igranic Electric Co., Ltd., and S. R. Wright. December 5th, 1932. (Cognate application 7619/33.) (403801.)

1933

762. "Electric discharge devices and circuits associated therewith." Radio Research Laboratories, Inc. September 14th, 1932. (403813.)

1178. "Conversion of current." Akt.-Ges. Brown Boveri et Cie. January 22nd, 1932. (403814.)

1818. "Cathode ray and so-called Braun tubes." Telefunken Ges. für Drahtlose Telegraphie. February 3rd, 1932. (403818.)

2229. "Electric liquid-heating receptacles." J. Morgan. January 24th, 1933. (403820.)

3198. "Internal-combustion engine-electric power units." Sulzer Frères Soc. Anon. March 24th, 1932. (403823.)

4527. "Electrical precipitation of suspended material from gases." Lodge-Cottrell, Ltd. (International Precipitation Co., Inc.). February 14th, 1933. (403829.)

5207. "Electrical oscillation generating arrangements." Telefunken Ges. für Drahtlose Telegraphie. February 19th, 1932. (403832.)

6285. "Electric lamps." British Thomson-Houston Co. March 1st, 1932. (403836.)

7754. "Resonating apparatus associated with loudspeakers and sound diffusers." A. D. Alton. June 3rd, 1932. (403843.)

12535. "Two-way telephone systems." Marconi's Wireless Telegraph Co., Ltd., and G. A. Mathieu. June 27th, 1932. (Divided application on 30721/31.) (403674.)

12619. "Thermal relay." J. E. Carlsson and Allmänna Svenska Elektriska Aktiebolaget. May 1st, 1933. (403857.)

13529. "Electrical contact plugs or pins." E. Kleinmann and A. Mendel (trading as Kleinmann, Geb.). January 21st, 1933. (403864.)

13626. "Television and like short-wave receiving and distributing systems." Marconi's Wireless Telegraph Co., Ltd. May 10th, 1932. (403865.)

14436. "Voltage control of electron-discharge devices." British Thomson-Houston Co., Ltd. May 20th, 1932. (403874.)

14862. "Charging systems for storage batteries." Chloride Electrical Storage Co., Ltd., J. L. Woodbridge and H. W. Beedle. May 23rd, 1933. (403875.)

15174. "Electron-discharge tubes for purposes of sound-recording or the like." Allgemeine Elektricitäts Ges. May 27th, 1932. (403876.)

18661. "Thermionic valve arrangements." Telefunken Ges. für Drahtlose Telegraphie. June 30th, 1932. (403730.)

21965. "Electric heater resistances." British Thomson-Houston Co., Ltd. August 5th, 1932. (403908.)

24078. "Traffic control signals." Automatic Electric Co., Ltd., and P. B. Renshaw. June 30th, 1932. (Divided application on 403720.) (403731.)

24843. "Traffic control signals." Automatic Electric Co., Ltd., and P. B. Renshaw. June 30th, 1932. (Divided application on 403720.) (403732.)

25988. "Rectifier systems for alternating current." British Thomson-Houston Co., Ltd. September 20th, 1932. (403922.)

26957. "Trolley-bases for electric vehicles." Westinghouse Electric & Manufacturing Co. September 30th, 1932. (403925.)

29495. "Means for fixing grids in anode-protecting tubes for metal-vapour rectifiers." Siemens-Schuckertwerke Akt.-Ges. October 24th, 1932. (Addition to 367648.) (403926.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 17th :—

Aladdin. No. 541859. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Aladdin Industries, Ltd., Long Drive, Greenford, Middlesex.

Micrion (lettering and design). No. 543631. Class 8. High-frequency coils for use in connection with radio-telephone receiving sets.—Radio Instruments, Ltd., Purley Way, Croydon.

Vegetol. No. 546046. Class 8. Electrical condensers.—Dubilier Condenser Co. (1925), Ltd., Victoria Road, North Acton, W.3.

Tonastat. No. 545751. Class 8. Radio-telephone and telegraph instruments, apparatus and parts thereof.—R. V. Langhart, trading as "T.X." Products, 32, Queen's Way, Ponders End, Middlesex.

Remor. No. 542109. Class 13. Reflectors and casings for electric lamps.—A. P. Andersen, Charlottenlund, near Copenhagen. (British representatives: Lloyd Wise & Co., 10, New Court, Lincoln's Inn, W.C.2.)

Erinoplas. No. 546754. Class 50. Thermoplastic or thermosetting plastic moulding compositions manufactured from synthetic resin, cellulose derivatives, casein, natural resins or bitumen.—Erinoid, Ltd., 58, Coleman Street, E.C.2.

The "British Coast"

THE motorship *British Coast*, which has just completed her trials and taken up regular service for her owners, Coast Lines, Ltd., has erroneously been referred to in the daily Press as an "all-electric" ship. There is, however, a certain measure of justification for the statement, since apart from the main propelling machinery—which consists of two 625-h.p. Diesel engines direct-coupled to the two propeller shafts—electricity has been used to a far greater extent for driving the auxiliary machinery than on any previous similar vessel.

The vessel is primarily a cargo carrier, her holds having a capacity of about 1,300 tons, but in addition she has accommodation for twelve passengers. Electricity for operating the cargo winches as well as for driving other machinery and for lighting purposes is provided by two d.c. 750 r.p.m. generators, one of 60 kW and the other of 45 kW, supplied by Campbell & Isherwood, Ltd., driven by Davey, Paxman Diesel engines. In addition there is a 10-kW generator driven by a belt from the starboard propeller shaft.

Perhaps the most notable of the auxiliaries is the cargo winch fitted to No. 1 hatch. This is of a new type having three electric motors which allow the hoisting, derricking and slewing to be carried out simultaneously by one man. It has a normal capacity of three tons and was supplied by Clarke, Chapman & Co., Ltd. The hoisting motor is of 25 h.p., the derricking motor of 20 h.p., and the slewing motor of 12½ h.p., the 3-ton load being lifted on a single fall at a speed of 100 ft. per min., while by means of three to one purchase blocks, a 7½-ton load can be handled. There are four 3-ton winches of ordinary design serving hatches Nos. 2 and 3, these also having been supplied by Clarke, Chapman & Co., Ltd.

The other electrical auxiliaries include the steering gear, which is driven by a Laurence, Scott motor with telemotor control from the bridge, a windlass with warping ends fitted on the forecastle deck and a warping winch aft. In the engine room the general service pump and the bilge and ballast pump are driven by electric motors of Sunderland Forge make. The whole of the electrical installation was carried out by the electrical department of Henry Robb, Ltd., Leith, the builders of the vessel. The wireless apparatus was supplied by the International Marine Radio Co., Ltd. The 200-W transmitter provides telegraph or telephone service on wavelengths between 120 m. and 220 m., and also between 580 m. and 620 m. The wavelengths covered by the receiving installation extend from 110 m. to 2,000 m. In addition, there is a radio direction-finding equipment of the International Marine Radio Co.'s "R.C.3A" type. A depth indicator was supplied by Henry Hughes & Son.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (50); T. James, builder, Ystrad Mynach.

Bath.—Houses (365); city surveyor. Technical college (£22,745); J. Long & Co., Ltd., builders. Reconstruction of statutory hospital (£15,928); borough engineer.

Birkenhead.—Further development of Prenton Hall Estate; A. G. Sharples. Further development of Warwick Hey Estate for N. S. Farrell; A. Lamb. Estate development, Woodchurch Road; A. H. Boulton. Municipal annexe, Gertrude Street; borough engineer. Stores, New Chester Road; British Leather Co.

Birmingham.—Factory, Robin Hood Lane, Hall Green, for Geo. Goodman, Ltd., 82, Caroline Street (£6,000), with electrical work; Wilfrid Robbins, Ltd., engineers, Great Bridge, Staffs. Offices, Station Road, Stechford, for the Ideal Benefit Society, Pitmaston, Moseley; Rich. O. Warder, architect, Pitmaston, Moseley. Shops, High Street, Erdington, for Hillier, Parker, May & Rowden, 27, Maddox Street, London; Hartley Smith (Birmingham), Ltd., builders, Erdington. Rebuilding of premises of Glass & Marble Co., Thorpe Street (£8,000), with electrical work; A. J. Gupwell, Ltd., builders, Park Street.

Blackpool.—Ten shops, Highfield Road; Hitchen & Bairstow, builders, Waterloo Road. Elementary school, Somerset Avenue, for E.C.

Blyth.—Shops and houses, Broadway Circle and Princess Louise Road; Thornton & Croft, trustees.

Boreham (ESSEX).—Further development of Boreham House Estate; Fordson Estates, Ltd.

Bournemouth.—Art gallery extensions (£6,000); borough engineer. Cinema, Malmesbury Park Road; Regal Cinemas, Ltd. Hotel, Southbourne Overcliffe Drive; H. Whiting. Twelve shops and flats, Belle Vue Road; T. B. Gossling. Shops and offices, Gervis Place and Old Christchurch Road; Rebbeck Bros. Additions to Congregational Church, Winton; Deacons. Alterations to "Elim" Church, Victoria Place; trustees.

Bridlington.—Houses (50); borough surveyor.

Cambridge.—Houses (100), Scotland Road Estate, for Hundred Houses Society, Ltd.; C. W. Craske, architect, 1, Tunwell's Court, Trumpington Street. Postal sorting office for H.M. Office of Works, King Charles Street, London, S.W.

Carlisle.—Fire station and police buildings for C.C. (£45,000).

Cheshire.—School (360 places), Cheadle Hulme, for County E.C.; county architect, Chester.

Chester.—Houses (150), Lache Estate; city engineer.

Chester-le-Street.—Houses (958); U.D.C. surveyor, Front Street.

Chichester.—Houses (33); city surveyor.

Coulsdon.—Development of Fairdean Heights Estate; Gunton & Gunton.

Dalbeattie.—Houses (120); R. Flynn, burgh surveyor.

Darfield (YORKS).—Houses (60); U.D.C. surveyor.

Dorking.—Houses (90); U.D.C. surveyor.

Dumfries.—Houses (462); burgh surveyor.

Dunfermline.—Shelter, band auditorium, and band kiosk, Pittencrieff Park, for the Carnegie Dunfermline trustees (£12,000); Master of Works, Trustees Office.

Eccles.—Branch library, reading room, public conveniences, shelter and caretaker's house, &c., at the junction of Parrin Lane and Worsley Road; T. Elce, surveyor, Town Hall.

Gainsborough.—Houses; U.D.C. surveyor.

Gateshead-on-Tyne.—Houses (80), Saltmeadows Estate; W. Welford, builder, Whitburn, South Shields. New premises, High Street, for Doggarts, Ltd. (£30,000); R. Hudson & Sons, builders, Sunderland.

Glasgow.—Houses (350), Bellahouston; Housing Director. Police barracks (£25,000), and welfare centre, Garngadhill (£6,500); city engineer and trade contractors. Two schools and two extensions; education director.

Glossop.—Rebuilding the Isolation hospital; borough engineer.

Gravesend.—Extensions to engineering works for E. A. & H. Sandford; T. C. Jones & Co., Ltd., builders, Shepherds Bush, London, W.

Grays.—Reconstruction of baths (£16,400); U.D.C. surveyor.

Great Yarmouth.—Houses (120), Middleton Road Estate; borough engineer.

Hamilton.—Houses (70); burgh surveyor.

Hartley Wintney.—Houses (50); R.D.C. surveyor.

Hoole.—Houses (60); J. F. Sumner, builder, Stansty, Wrexham.

Huddersfield.—Secondary school, Highfields, for Borough E.C.; director of education.

Hyde.—Extensive additions to works, Newton Mill, Jacobsen, Welch & Co.; Wellerman Bros., Ltd., builders, Edward Street.

Kendal.—Houses (120), for the Kendal and District Housing Association; Oliver & Leeson, architects, Ellison Place, Newcastle-on-Tyne.

Kent.—Central schools, Sandwich, for County E.C.; county architect, Maidstone.

Kidderminster.—Houses (60), Broadwaters; B. Denning, builder, Walsall. Houses (250); borough surveyor.

Lanarkshire.—Post-primary schools, Cambuslang and Hamilton, for County E.C.; director of education, Renfield Street, Glasgow. Reconstruction of school, Airbles Street, Motherwell, for C.C. (£44,000); County Council architect, Hamilton.

Lancashire.—Senior Council School, Huyton, Liverpool, for C.C.; E. Taylor & Co., Ltd., builders, Ebor Saw Mills, Littleborough. Conversion of existing Council School, Elliott Street, Tyldesley, into Senior Girls' Council School for C.C.; James Cocker, Ltd., builders, Station Saw Mills, Walkden, Manchester.

Leeds.—Houses (2,500), Gipton Estate, Harehills; city surveyor.

Lincolnshire.—Schools, Spalding and Lutton, Holland, for County E.C.; director of education, Boston.

Liverpool.—Houses (38), Beech Green, Almonds Green, for Thomas Percy, Ltd., 14, Dale Street; W. T. Clarke, architect, 9, Redcross Street. Houses (166), Rudyard Road, for the District Estates, Ltd., 19, Castle Street; A. Ernest Shennan, architect, 14, North John Street. Extensions, Church Road, for Blue Coat Hospital, with electrical work; Briggs & Thorneley, architects, 622, Royal Liver Building.

London.—(BERMONDSEY).—Flats (90), Cherry Garden; Works Department. (CATFORD).—Houses (108), Callander Road Estate and 24 houses, Lescombe Close; L. A. Culliford. (FOREST HILL).—Reconstruction of 26-8, London Road; F. W. Woolworth & Co., Ltd. (HENDON).—Extension, Cottage Hospital (£18,000); Wallace Marchment, architect. (LEWISHAM).—Houses (14), The Woodlands; P. B. Dannatt. (PADDINGTON).—Flats, Florence Court, Maida Vale; Burnett & Eprile. (ST. JOHN'S WOOD).—Block of flats, Abbey Road; Col. H. D. Cart de Lafontaine. (ST. MARYLEBONE).—Shops and flats, Upper Gloucester Place, Boston Street, and Linhope Street; W. E. Masters. (STEPNEY).—Tenements, Market site (£35,000); borough engineer. (TOTTENHAM).—Houses (77), and pumping station, Craven Park Road; S. & A. Foux. Houses (26), Devonshire Hill Lane; Geo. Reed & Son. Nurses' home extensions, Prince of Wales Hospital; Governors. Extensions, Bruce Grove Hall; Tottenham Cinema Co., Ltd.

Luton.—Extensions to Maidenhall schools (£6,135) and school, Beechwood Road, for Borough E.C.; S. C. Parrott, architect.

Lytham St. Anne's.—Gymnasium and manual room, King Edward VII School, Fairhaven, for the Governors of the Lytham Schools Foundation; Francis L. Lumb, architect, 19, Clifton Street, Blackpool.

Manchester.—Houses (73), Carrington Road, Flixton, with electrical installations; R. Sanderson, builder, Western House, Western Road, Flixton. R.C. church, Livesey Street (£30,000), with electrical work; H. Greenhalgh, architect, 15, Mawdesley Street, Bolton. Offices, Wilmslow Road and Hardman Street, Didsbury, for the Manchester Collieries, Ltd., Arkwright House, Blackfriars; W. T. Gunson & Son, 10, Marsden Street. Rebuilding and additions to factory after fire, Cheltenham Street, Regent Street and Herrboby Street, Collyhurst, for Acme Tin Stamping Co., Ltd.; P. Hamer, Ltd., builders, 15, Park Street, Swinton.

Middlesbrough.—Extensions to the West Lane Hospital £11,800); T. E. F. Whitear, builder, Norton-on-Tees.

Newbury.—Extensions, chair factory, West Mills; Keen & Co., Ltd.

Newcastle-on-Tyne.—Extensions to the Royal Victoria Infirmary; T. Curry, builder, Meldon Street.

Newport (SALOP).—Houses (38); U.D.C. surveyor.

Northwich.—Chapel, Antrobus (£2,000), with electrical installations; A. Brocklehurst & Co., architects, Martin's Bank Buildings, 10, Norfolk Street, Manchester.

Paignton.—Café, Goodrington Sands; U.D.C. surveyor.

Pontefract.—Houses (28), Grove Lea Building Estate, for Pontefract Building Estates, Ltd. Factory extensions for Robinson & Wordsworth, Ltd.

Portsmouth.—Houses (114), Victory housing scheme, Tipnor; H. Collins, architect.

Richmond (SURREY).—Houses (77), Ham; borough surveyor. Flats (78), Richmond Hill; R. Gibson, Ltd.

Rochester.—Houses (24), Smith Street; W. Law, city surveyor.

Runcorn.—Houses (332) and shops, Heath Road Estate, and 28 houses, Hintern Road, for S. V. Broadbridge, Ltd., builders.

Sedgefield.—Houses (100) and bungalows; J. Stones, R.D.C. surveyor.

Shropshire.—Technical college, Shrewsbury, for County E.C.; Education Offices, County Buildings, Shrewsbury.

Somerset.—Police station, courtrooms, quarters, &c., Weston-super-Mare, for C.C.; A. J. Toomer, county architect, Park Street, Taunton.

Southend-on-Sea.—Factory, for Commercial Rubber Co. Extensions, Rochford Institution (£5,213); V. G. Selwood & Co., builders, Chelmsford. Pier entrance, pavilions, &c., for Essex Piers, Ltd., 122, Charing Cross Road, London, W.C.

Standish-with-Langtree.—Houses (42); U.D.C. surveyor.

Stockport.—Extensions to works, Bredbury, for William Crossland, Ltd.; Roger B. Key, Ltd., builders, Hyde Road Saw Mills, Woodley, Cheshire.

Sunbury-on-Thames.—Houses (64), Green Lane; U.D.C. surveyor.

Taunton.—Houses (20), Cleveland Street, for Stansell & Son.

Teddington.—Houses (354), River Meads Estate, for South-West (London) Properties, Ltd

Truro.—Excise offices and shops, Lemon Quay; W. S. Reed, 75, Cobourg Street, Plymouth.

Twickenham.—Houses (43), Pauline Crescent; George Heath (Builders), Ltd., Percy Road, Whitton. Houses (186), Whitton Park Estate; P. Chase, Gardener & Co., architects, Hounslow.

Tynemouth.—Houses, Bolingbroke Road; G. W. and S. Black, builders, Upper Toll Street, North Shields. Aerodrome, Rake House Lane; borough engineer. Senior school, Links Avenue, for E.C.

Wakefield.—Houses (58), Flanshaw Lane; J. P. Firth, architect, 4, King Street. Swimming bath extensions, Almhouse Lane; P. Morris, architect, Town Hall.

Walsall.—Super stores, Park Street, for Marks & Spencers (£30,000), with electrical work; Bovis, Ltd., builders, London. Completion of St. Joseph's Church, for the Rev. Father P. Moore; T. Lowe & Sons, Ltd., builders, Curzon Street, Burton-on-Trent.

Warrington.—Extensions, Borough Hospital; borough engineer.

Windsor.—Houses (31), Woodland Avenue, for W. Varney. Houses (60), Dedworth; surveyor.

Wolverhampton.—Estate development, Cannock Road and Park Lane, with houses (electrical work); Messrs. Boswell, builders.